DERMOIDS.

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Sir John Bland-Sutton

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DERMOIDS:

OR,

TUMOURS CONTAINING SKIN, HAIR, TEETH, &c.

BY

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PREFACE.

THE facts, and opinions founded upon them, contained in this book formed the substance of my Hunterian Lectures, delivered at the Royal College of Surgeons, February, 1889. I have ventured to publish them because dermoid cysts have not, so far as I am aware, been studied from the evolutionist's point of view. Much of the material utilized in my investigations on ovarian dermoids was furnished me by my colleague Mr. Henry Morris; my most instructive specimens I owe to Dr. Granville Bantock, who has on many occasions taken great pains in order that the tumours should be in my hands before they lost their tissue-life; his thoughtfulness and kindness I cannot too highly appreciate. Some of the material has been the result of my own operative endeavours.

I am greatly indebted to the Councils of the Pathological, Obstetrical, and Gynæcological Societies for permission to obtain electros of blocks illustrating my papers and reports in their Transactions. Without such indulgence this work would have suffered greatly, for, deprived of the free use of drawings, a work on dermoids would resemble a book on geography written without reference to maps

48, QUEEN ANNE STREET, W., 1889.

LECTURES ON EVOLUTION IN PATHOLOGY.

CHAPTER I.

DERMOIDS.

General Considerations.

DERMOIDS *are cysts, or tumours, furnished with skin or mucous membrane (which may or may not be accompanied with the appendages peculiar to these structures), occurring in situations where skin and mucous membrane are not normally found.*

In the simplest form of dermoid cyst the interior is lined with skin, the epidermis of which is very thin; from the skin sprout hairs furnished with sebaceous glands, often of very large size. Sweat glands may or may not be present. The cavity of such a cyst is occupied by pultaceous material, composed of sebum, cholesterin, and shed hairs; often these hairs are rolled into balls. The sebaceous matter in such cysts is the result of the activity of the glands lodged in its walls.

In more complex dermoids, in addition to hair and skin, we find muscle fibre, unstriped and striped (the latter is rare), teeth, and even mammæ.

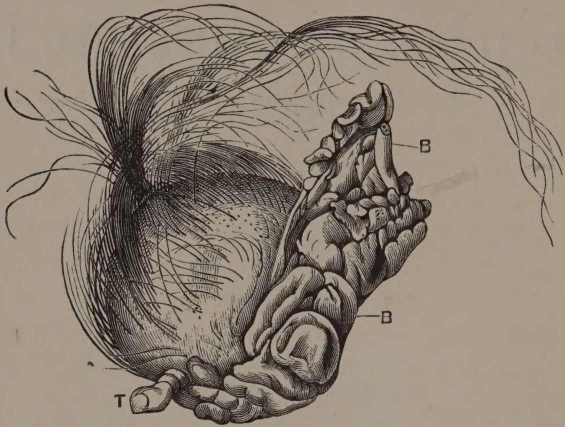

Fig. 1.

A Pedunculated Dermoid Tumour from the Rectum (after Danzel).
T, Tooth. B B, Attached Portion of Pedicle.

Dermoid tumours, on the other hand, are solid and pedunculated. The greater proportion of the tumour is made up of connective tissue, fœtal hyaline cartilage, and fat; nerve tissue has occasionally been detected. The exterior is covered with skin from which hair, often many inches in length, grows. The skin is furnished with sebaceous glands; teeth may project on the surface or lie embedded in the midst of the tumour. The pharynx and rectum are the most frequent situations for such tumours.

Tumours containing formed organs other than those belonging to skin or mucous membrane are not dermoids, but suppressed or parasitic fœtuses.

Each of the elements found in dermoids will now receive separate consideration, for they present extraordinary variations.

1. *Skin.*—The cutaneous tissue found in dermoids varies within very wide limits. In some specimens it is very thick, and is identical with that covering the exterior of the body ; the epidermal cells form a very thick layer ; papillæ may be present, but this is rare. In by far the greater number of dermoids occurring in the ovary, and even in those found in such superficial situations as the angles of the orbit, the epidermis is usually extremely thin, and in some cases scarcely recognisable. The rete malpighii in some cases contains pigment. So far as my reading and observation extend, I know of no case in which nerves or peripheral end-organs have been detected in the skin of dermoids, even when papillæ have been present. This may be owing to the fact that such organs require special methods of preparation for their demonstration. That they occasionally exist is very probable, for the skin lining the cavity of a dermoid in some cases possesses tactile sensibility. In the majority of specimens examined by me the rete malpighii resembled the deeper layers of the stratified epithelium found in the mouth, and the wavy arrangement so characteristic of normal skin I have only once seen. The deeper layers of the skin possess a quantity of fat, the cells of which possess walls of great delicacy, and the nucleus is pushed to one side.

2. *Hair.*—Next to skin, hair is the most constant structure

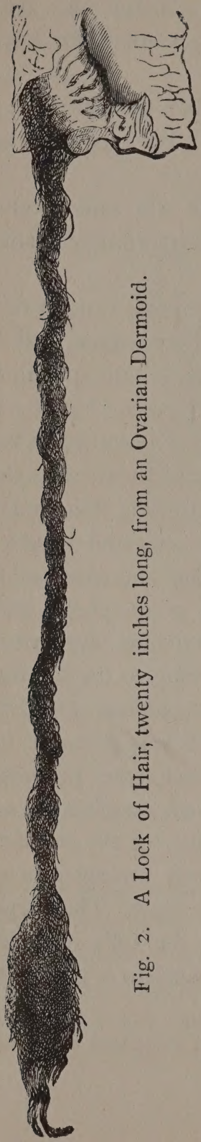

Fig. 2. A Lock of Hair, twenty inches long, from an Ovarian Dermoid.

found in dermoids, but it varies greatly in amount. In rare cases it may be entirely wanting. In a few instances only one hair could be found even on the most careful scrutiny; in others five or six may be seen, but more frequently they are innumerable. The hairs usually resemble lanugo, but they may be as coarse as those on the heads of adults. In length they are variable; in some cysts they measure a few lines in length, in others two feet or more. When short they sprout freely into the cyst cavity, and when shed they may be mixed up with the sebum or rolled into oval balls. The hairs now and then form a long tuft, which lies coiled like a rope. When the hairs are short they, as a rule, sprout from all parts of the cyst wall; when long may be limited to a small area. The colour is equally capricious, and usually bears little relation to that on the body of the individual; in an ovarian dermoid removed from a negress the hair was curly, but light brown in colour.

In animals other than man dermoids contain hair or wool, according to the nature of the tegumental covering. In sheep dermoids contain wool, in horses and oxen hair, black in some, light brown in others. Lebert refers briefly to dermoids in birds, and as would be expected they contained feathers.

There is reason to believe that hair in

dermoids changes in colour according to the age of the individual, for when such tumours are removed from elderly individuals they frequently contain grey hair; sometimes it is quite white.

I am unaware of a case in which grey hairs were found in a dermoid removed from a young subject. There is good reason to believe that hair in dermoids is influenced by age in the same way as that on the exterior of the body. The museum of the Middlesex Hospital contains an excellent specimen of multilocular cyst of the ovary removed by Mr. J. W. Hulke from an old woman over sixty years of age, whose scalp was bald, and the scanty hairs she possessed were quite white. On examining the cyst a large ball of light brown hair was removed from one of its loculi, but even the most critical examination failed to reveal the spot from which it originally grew. The only explanation was that as age advanced the hair in the dermoid, like that on the woman's head, was shed. On examining the cyst wall I failed to detect even epithelium.

We must remember that a hairy patch of skin may occur in the interior of a cyst lined with mucous membrane, reminding one of the cutaneous patch on the buccal aspect of a rodent's cheek, or those piliferous patches of skin which occasionally appear on the cornea of man, horses, oxen, dogs, and woolly patches in sheep.

3. *Sebaceous Glands.*—As hairs are so commonly found in dermoids, it necessarily follows that sebaceous glands are associated with them; but sebaceous glands in the wall of a dermoid differ in some points from those normally existing in the skin. They are of very large size, with wide ducts and dilated acini. Sebaceous retention cysts are not infrequent in the walls of dermoids, and are often of large size. A section of the wall of a dermoid rich in glands is shown in fig. 3.

On one occasion I found several sebaceous cysts in the wall of an ovarian dermoid; in two of them a mass of horny material projected, resembling the cutaneous horns occasionally seen sprouting from sebaceous cysts. In the remaining cysts the horny matter was lodged in the cavities, and resembled nail in texture.

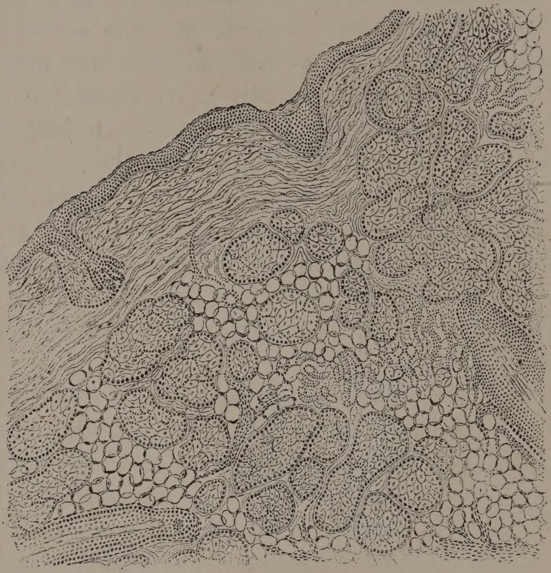

Fig. 3.

Magnified Section of the Wall of a Dermoid, showing the Sebaceous Glands. Two groups of sweat glands have been divided in the section.

The museum of the College of Surgeons contains some similar specimens, described in the catalogue as "small pieces of a substance like an ill-formed horn, such as grows sometimes from a diseased hair follicle; they were removed from an ovarian cyst. (From the museum of J. Heaviside, Esq.)"

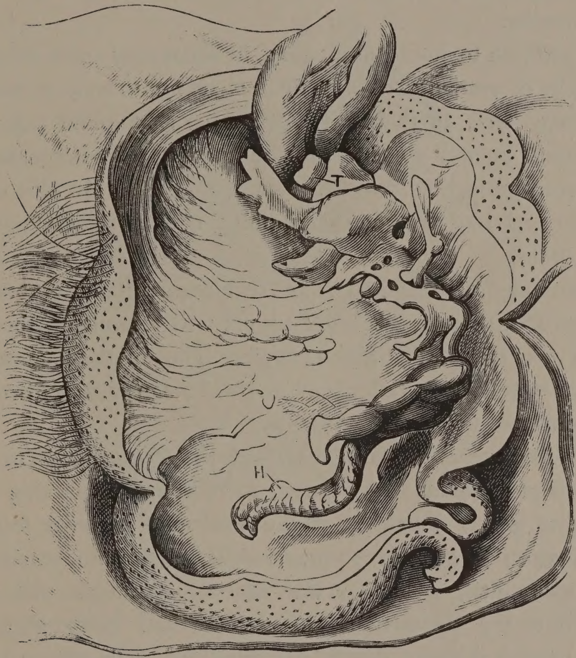

Fig. 4.
An Ovarian Dermoid, containing Teeth (T), Bone, and a Cutaneous Process furnished with a Nail-horn (H), (after Cruveilhier).

The formation of horny matter in a sebaceous cyst of the ovary is of interest because it indicates that when such horns arise in connection with sebaceous cysts of the skin it depends upon something more than the mere exposure of the sebaceous matter to the desiccating influence of the atmosphere; there is some vital process concerned in their formation.*

In rare instances the walls of a sebaceous cyst may undergo calcification.

In addition to horns originating in sebaceous cysts lodged in the walls of ovarian dermoids, there is reason to believe that true nails may form in them. Mr. Thornton † exhibited before the Obstetrical Society in 1882 an ovarian dermoid; it contained a cutaneous projection furnished with a long nail. In this case it is to be regretted that the description is so very meagre and without a drawing.

Cruveilhier ‡ has figured an ovarian dermoid which contained a finger-like process, furnished with a nail resembling the overgrown nails seen in bedridden people. Thus of the four varieties of cutaneous horns which occur in the human subject, two have been detected in ovarian dermoids.

The Pultaceous Material contained in Dermoids.—The fluid contents of dermoids vary greatly; in most specimens they are of the same greasy character as the semi-solid material found in sebaceous cysts, and are composed of fat, sebum, cholesterine, and shed epithelium, mixed in the case of dermoids with hairs. Sometimes the material is pure sebum, and quite white. In many cases it is glairy, due to free admixture with mucus derived from mucous glands lodged in the wall of the cyst; at times it consists wholly of mucus; these last conditions are found chiefly in ovarian dermoids. In rare cases dermoids have been found to contain a collection of rounded bodies resembling pills; they are collections of epithelial cells rolled into balls.

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* Trans. Path. Soc., vol. xl.

† Trans. Obstet. Soc., London, 1882.

‡ Anatomie Pathologique, liv. xviii., pl. v., figs. 3 and 4.

Subjoined is a detailed analysis of the contents of a pelvic dermoid:—

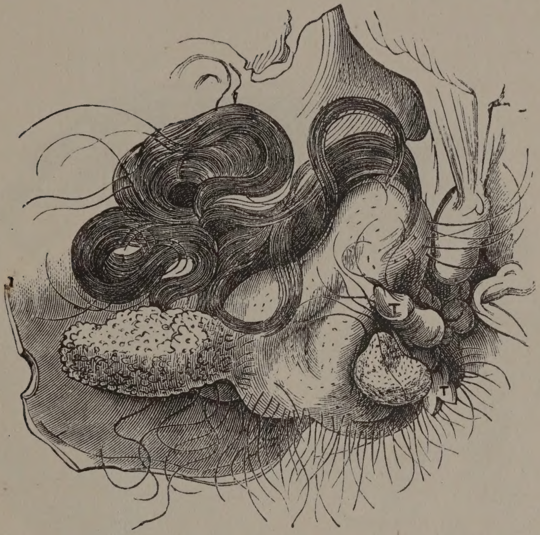

Fig. 5.
An Ovarian Dermoid, containing a Fold of Skin resembling a Shrunken Mamma (Museum, Royal College of Surgeons). T T, teeth.

Bernay's Analysis of the Contents of Dr. Ord's Case.

Melting-point	32° C.
Sp. gr. at 38° C.	0·8855.
Fixed fatty acids	98·4.
Volatile	0·06.
Oleic acid	56·64.
Glycerin	0·45.

Mammary Glands.—It is no uncommon event to find in the interior of an ovarian dermoid one or more tags of skin resembling a nipple, associated with teeth and hair. Not infrequently these nipple-like processes of skin are attached to more or less rounded projections of tissue, which recall in a striking manner the shrunken mammæ of a woman who has given suck to many children (fig. 5). The nipples in these cases are imperforate, and beset with large sebaceous follicles. In other cases the mamma may be plump and well formed (fig. 6), but is composed of fat covered superficially with skin. Even in

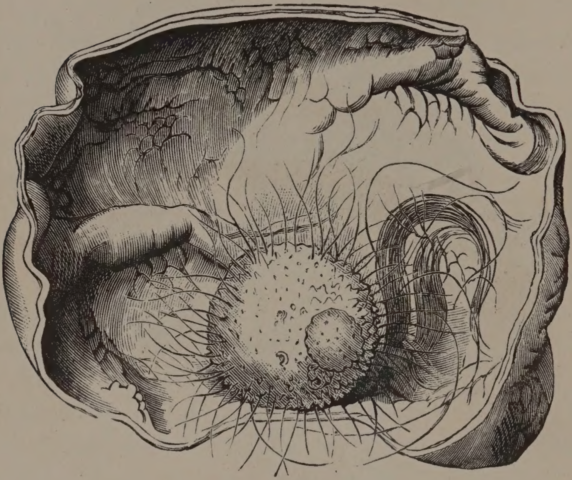

Fig. 6.

An Ovarian Dermoid with a Spurious Mamma and Nipple growing from its Wall (Museum, Royal College of Surgeons).

such a case as this no ducts or gland tissue occupy the substance of the mass, although the nipple is surrounded by an areola. Though the nipples of these pseudo-mammæ have no ducts, yet it does not of necessity follow that glandular tissue is absent in the substance of the mamma, for in a specimen described by Shattock the nipple was imperforate, but a cyst filled with colostrum occupied the base of the mamma.

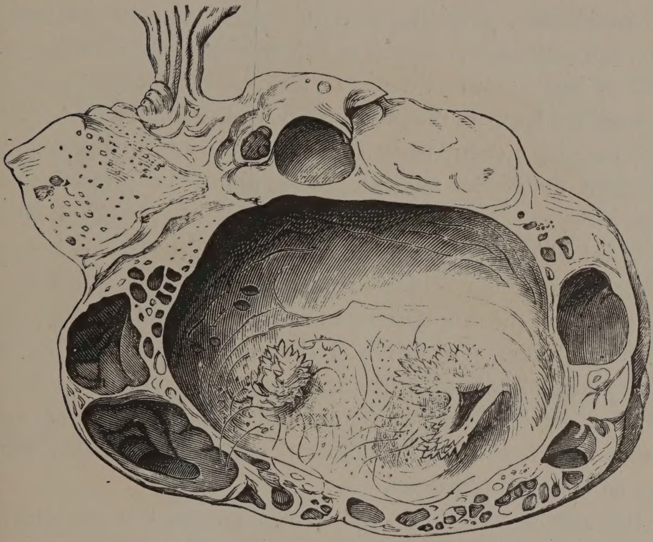

Fig. 7.

An Ovarian Dermoid nearly natural size, with two Nipple-like Projections. At the base of the larger one is a cavity lined with squamous epithelium. Sebaceous cysts with calcified walls surround the main cavity.

A similar specimen has come under my notice, and is represented in fig. 7. In this case we have an ovarian dermoid the walls of which are beset with numerous clusters of cysts and isolated cavities. Many of the cysts are distended ovarian follicles, but others are sebaceous cysts, and one of them has calcified walls. Projecting from the wall of the chief cyst may be seen two cutaneous prominences, villous-looking, and furnished with tufts of hair an inch or more in length. On making a section through the larger of the two prominences, we find a cyst capable of containing a cherry-stone occupying its base. On examining the parts under the microscope the nipple-like projections are seen to be crowded with villous processes of epithelium, resembling the filiform papillæ of the tongue, whilst around them are clusters of very large sebaceous glands; the pit-like depressions on the surface of the skin-covered area of the cyst wall are the orifices of these glands. The cavity at the base of the nipple is lined with several layers of squamous epithelium. In some of the sections obtained from the "nipple" a small cluster of sweat glands was detected lying among the sebaceous glands; this is not an unusual occurrence.

It is also a fact worth noting that the hairs in this cyst are entirely confined to two tufts directly associated with the nipples.

The museum of the Middlesex Hospital contains an ovarian dermoid presenting a mamma furnished with a nipple possessing ducts communicating with glandular tissue lodged in the substance of the mamma.

These three specimens illustrate a point of some importance, viz., the abundance of hair with which they are surrounded, and the extremely large size of the sebaceous glands lodged in the skin which covers the mamma.

My most perfect specimen was obtained from an ovarian dermoid removed by Dr. Granville Bantock. The cyst is of the size of a cocoa-nut, and was filled with the usual pultaceous material and hair (fig. 9). Projecting from the wall of the cyst is a mamma as large as a Tangerine orange. Passing from each side of the mamma were two long slender processes covered with skin,

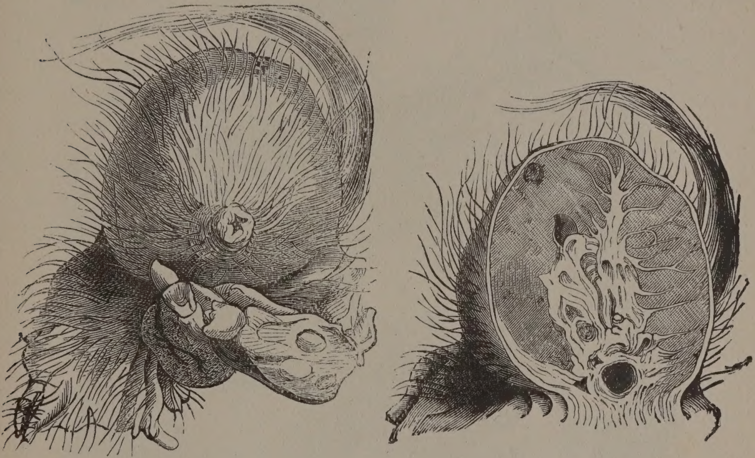

Fig. 8.
Mamma from an Ovarian Dermoid. The right-hand figure is shown in section, so as to display the glandular tissue.

attached by their distal extremities to the cyst wall. The base of the processes was surrounded by an areola. When divided, these skin-covered processes were found to be hollow, and communicated with glandular tissue in the midst of the mamma. This glandular portion was small in amount, and embedded in rich yellow fat of delicate texture. The ducts and passages were filled with fluid resembling very poor but viscid milk ; under the microscope this fluid had all the characters of milk, and contained colostrum globules.

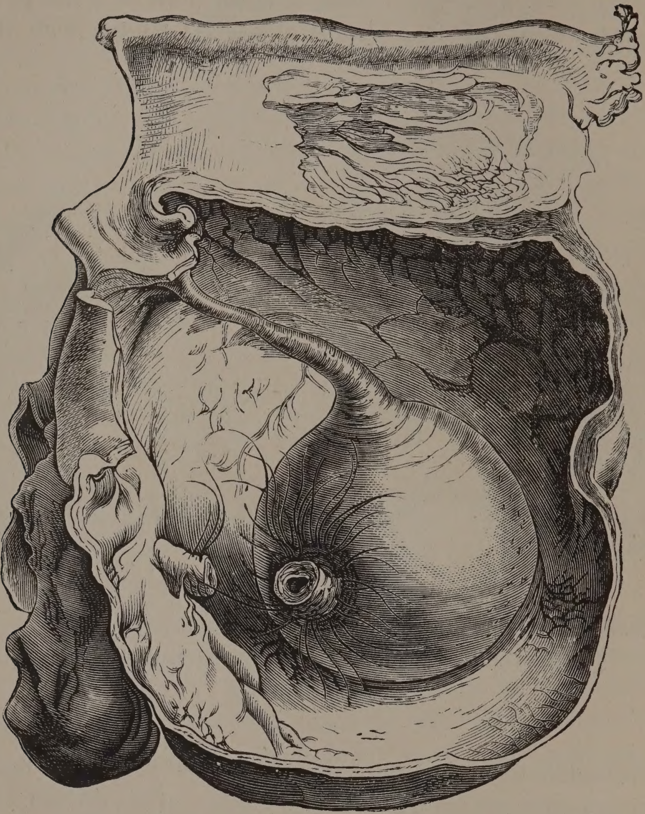

Fig. 9.
A Mammiferous Dermoid. The gland has two tube-like nipples, one of which has been divided.

Structurally the secreting tissue of the gland differed from the normal mamma only in the character of the epithelium, which instead of being cubical in shape, was spheroidal and arranged several rows deep. In the midst of the secreting tissue of this mamma several isolated pieces of cartilage of the hyaline variety were detected.

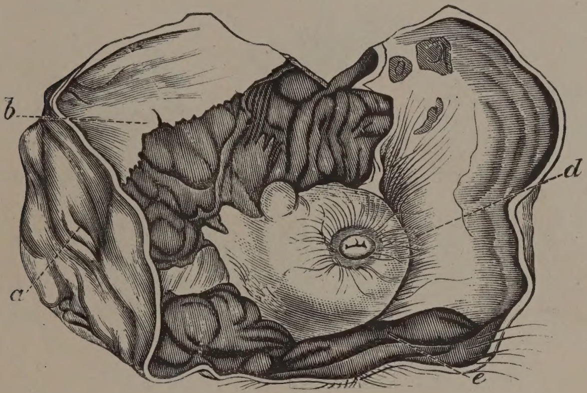

Fig. 10.

A Mammiferous Dermoid (Von Velits).

The first to describe a mammary gland in an ovarian dermoid seems to have been Haffter.* The mamma was rudimentary in character. De Sinéty † has recorded a similar observation.

Dr. Desiderius von Velits‡ was the first to describe an example of mammiferous dermoid which yielded milk and colostrum (fig. 10); but beyond describing an isolated specimen, no one has attempted to trace the various stages from cutaneous tags to fully formed glands until my communication was made to the Pathological Society in 1887.*

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* "Ueber Dermoide," *Arch. der Heilkunde*, xvi., p. 56, 1875.

† "Traité Prat. de Gyn.," 2nd ed., Paris, 1884, p. 749

‡ *Virchow's Archiv*, Bd. cvii.

Up to the present I have not succeeded in obtaining, in so far as histological details go, so perfect a specimen as the one reported by Velits. In this case the glandular elements were typical of the normal mamma, and are well displayed in the drawings accompanying his paper (fig. 11).

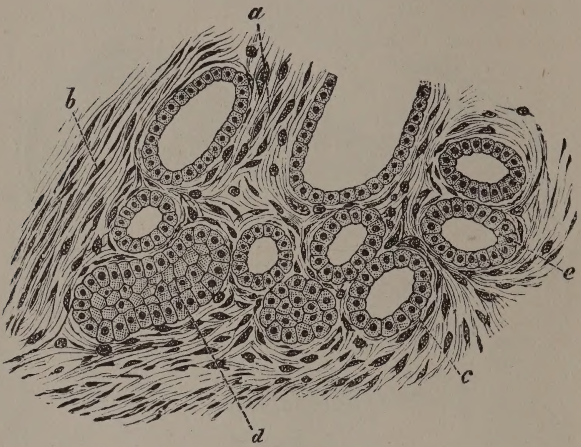

Fig. 11.
The Histological Characters of the Ovarian Mamma described by Velits.

Ovarian nipples and mammæ are interesting from the evolutionist's point of view. Most persons who have studied the question are of opinion that a mamma ought to be regarded as a collection of modified sebaceous glands. As a rule, milk-glands are furnished with a cutaneous process or nipple, in relation with which the excretory ducts open.

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* Trans. Path. Soc., vol. xxxix.

In monotremes, as in the early human embryo, the ducts open on a plane surface of skin (fig. 12, A); in other mammals normal mammæ are furnished with cutaneous processes called nipples, or teats. Teats have been divided by Gegenbaur into two kinds true and false.

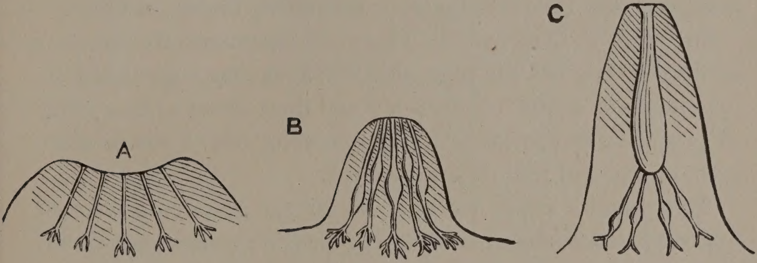

Fig. 12.

Three Types of Mamma.
A, Monotrematous Form, without Nipple. B, True Nipple (Man).
C, The False Nipple (Cow).

The true teat (fig. 12, B) is traversed by the ducts of the gland but in the false teat (fig. 12, C) the ducts open at the base of a furrow formed by the uprising of the surrounding skin.

In ovarian mammæ the teats, or nipples, are of the true form, for the ducts traverse the nipples. In very many specimens the mamma is simply represented by a nipple, everywhere beset with very large sebaceous glands.

It is also of interest to remember that supernumerary mammæ occurring in situations other than in the line of the epigastric arteries affect most frequently regions where hairs are most abundant, *e.g.*, the axilla. When occurring in ovarian cysts they also obey this rule; the large size of the sebaceous glands in ovarian dermoids has been noticed by all who have studied this department of pathology. The secretion of a mamma agrees in principle with that of a sebaceous gland, for milk is justly defined as "a natural emulsion." Thus ovarian mammæ may be regarded as something more than pathological curiosities. It may be mentioned that, like the normal mammary gland, they become the seat of adenoceles, and may even contain tissue resembling hyaline cartilage.

Mr. A. H. F. Cameron,* in a paper on supernumerary mammæ, ascribed to Laycock the suggestion that a mamma might make its appearance on any part of the body, and there seems to be a power of producing this particular organ, reminding one of the development of hair and teeth in ovarian cysts.

This would account for their occasional occurrence in such apparently extraordinary situations as the labia majora and minora. From the latter situation I removed a typical supernumerary mamma; it was as large as a cherry, furnished with a nipple, and rich in glandular acini.

Sweat Glands.—These are by no means frequent in dermoids, and when present they are usually seen as small isolated clusters surrounded by sebaceous glands. When their ducts are detected traversing the skin I have never seen them presenting the characteristic twist so constant under normal conditions. A cluster of sweat glands is shown in section in fig. 11.

Bone.—Osseous tissue is often present in dermoids, especially those occurring in the ovary; it may or may not be associated with hyaline cartilage, and cartilage may occur unassociated with bone, but this is rare. Bone occurs in two forms—(1) in loose, porous, ill-formed, and shapeless masses, resembling alveolus in texture; or (2) as shapeless plates, exceedingly hard, and resembling, as Doran aptly suggests, the facial bones of an osseous fish.

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* *Journal of Anat. ana Phys.*, vol. xiii., p. 152.

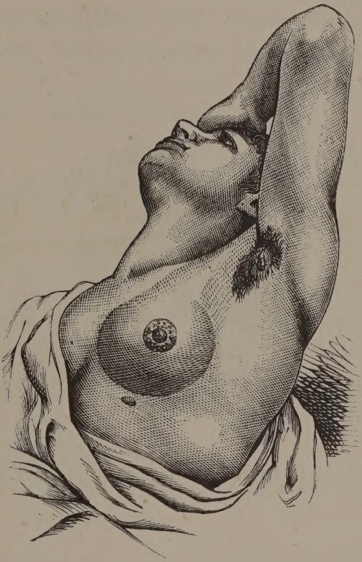

Fig. 13.
An Axillary Mamma (after Leichtenstern).

Teeth.—These are by no means constant structures in dermoids; indeed, in the majority of specimens teeth are wanting. Dermoids of the ovary often possess teeth, and those connected with the rectum; in other situations they are rare. Teeth, when present, may vary in number from two or three up to three hundred. Such teeth may be embedded in definite bony sockets, or sprout from from the cyst wall. Not infrequently the bone lodging such teeth resembles a superior maxilla (fig. 14). As a rule, the teeth resemble in shape those of the milk dentition, and some observers have described germs as of permanent teeth growing in relation with them; this, however, requires confirmation. I have never succeeded in detecting them. The teeth present the usual disposition of enamel, dentine, cementum, and pulp; nerves have been described entering the pulp, but this requires more abundant confirmation. It is somewhat remarkable that caries very rarely attacks teeth contained in dermoids. Secondary dentine has been detected in the pulp chamber of these aberrant teeth.

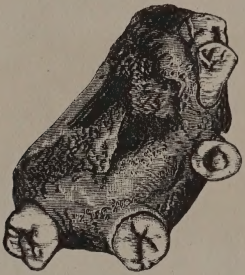

Fig. 14.
A Piece of Bone from an Ovarian Dermoid, lodging Teeth.

The resemblance of the bone supporting teeth and denticles in ovarian cysts to maxillæ has often been mentioned, but we must not regard this likeness in any serious light, because the maxillæ owe their peculiar shape to the presence of teeth, and when the jaws are deprived of teeth, as in old age, and in edentulous mammals, the resemblance fails. We may safely attribute the jaw-like appearance of bone in ovarian cysts to the presence of teeth.

Mucous Membrane.—Dermoid cysts containing mucous membrane occur in two situations, viz., in connection with the post-anal gut and the ovary. In the latter organ mucous membrane may form part of a tumour which is lined chiefly with skin, but when the cyst presents only mucous membrane it is often described as a multilocular glandular cyst. In some specimens the mucous membrane in the cysts is furnished with locks of hairs, and it is a fact of some interest that under abnormal conditions pilose mucous membrane is often met with. In some ovarian dermoids, when no hair, teeth, or glands are present, it is often difficult to

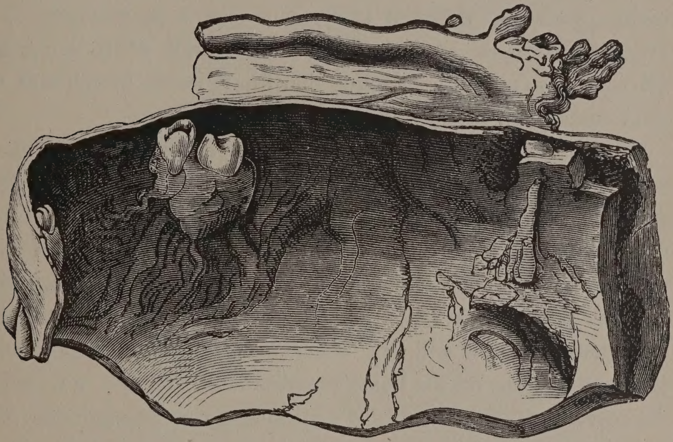

Fig. 15.

An Ovarian Dermoid, containing Teeth, but no Hair, Skin, or Glands.

determine whether the cyst is lined with skin or mucous membrane.

As a rule, the epithelium covering the mucous membrane in ovarian cysts is columnar, and arranged in the most regular manner conceivable, even in the acini of the glands. At other times the surface epithelium is squamous and arranged several layers deep, whilst in a multilocular cyst the shape of the epithelium varies in different cysts, as a result of pressure. The mucous membrane in such cysts is soft, pink when living, and velvety to the touch, resembling that found in the bowel, and the fluid contents of such cysts is identical with mucus.

Mucous Glands.—These are found in cysts lined with skin, as well as in those presenting undoubted mucous membrane. The general characters of mucous glands occurring in ovarian cysts may be studied in fig. 16. They differ from those occurring in the normal mucous membrane by their greater complexity. Another peculiar feature is that they are not equally distributed throughout the cyst wall, but occur in patches, often producing slight projections on the lining membrane of the cyst not unlike the cotyledons in the uterus of a recently delivered ruminant. The peculiarity in the disposition of glands in these cysts will be fully considered in the chapter devoted to ovarian dermoids.

Among other structures found in ovarian dermoids, mention must be made of the curious eyelike organ detected by Baum garten.* In a multilocular ovarian dermoid he found in one of the cavities a structure closely resembling a fœtal eye. It presented a transparent portion, shaped like a watch-glass, and of the size of a pfenning, corresponding to the cornea. When the organ was sagittally bisected a cavity of the size of a cherry-stone was found, containing clear fluid. The walls of the cavity were lined with a delicate layer of pigmented epithelium resembling the uvea of a normal eye. Nothing in any way resembling a retina could be detected.

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* "Ueber eine Dermoid Cyste des Ovarium mit augenahnlichen Bildungen, *Virchow's Arch.*, Bd. cvii., s. 515.

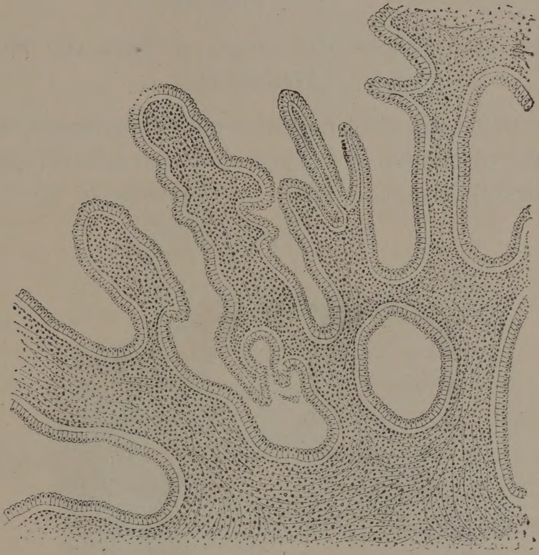

Fig. 16.

Magnified Section of an Ovarian Cyst, containing Mucous Membrane and Mucous Glands.

CHAPTER II.

THE IDENTITY AND MUTABILITY OF SKIN AND MUCOUS MEMBRANE.

BEFORE proceeding further, it will be convenient to discuss the relationship of skin and mucous membrane. Skin in its most typical condition covers the exterior of the body, and possesses, in addition to the horny layer, a rete mucosum containing pigment. In many animals it furnishes protective structures, as scales, horn, scutes, quills, bristles, feathers, hair, etc., all of which are modifications of the papillæ or the epidermis. Cellular down-growths give rise to glands which may furnish sebum,

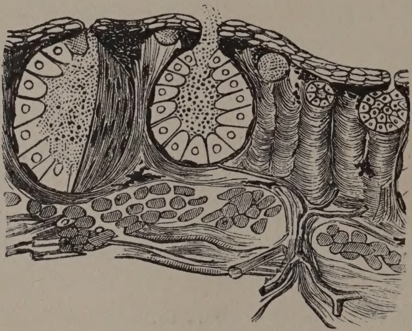

Fig. 17.
Mucous Glands in the Skin of a Salamander.

mucus, poisonous fluids, and milk ; in some cases a shell, often very complex, is formed, and in rarer instances pearl. Subject as skin is to external modifying influences, we need not express surprise at the variety of structure and modification exhibited by it.

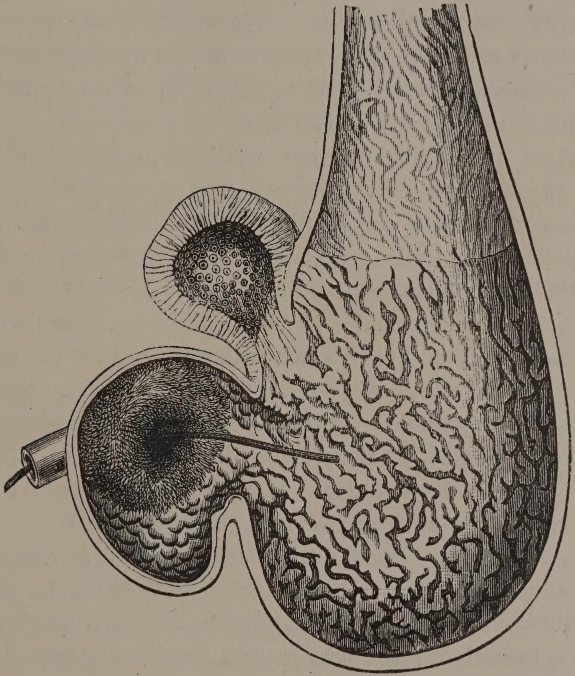

Fig. 18.
The Stomach of the Darter (*Plotus Anhinga*), showing the Hairy Pyloric Plug (from a specimen in Mus., R Coll. of Surgeons).

Mucous membrane in its most typical form exists in the intestines. It is covered superficially by a single layer of columnar epithelium, which may be ciliated, as in amphioxus, petromyzon, ammocœtes. The epithelium dips below the surface to form mucous glands. On comparing a section of skin with a typical section of mucous membrane the difference is very striking. In addition to structural characters, we have an embryological one; viz., cutaneous epithelium is epiblastic in origin, whilst that of mucous membrane is hypoblastic.

Instead of intestinal mucous membrane, let us select a piece from the buccal cavity. Here we find it lined with layers of flattened epithelium surmounting papillæ; some of the papillæ are calcified and form teeth; in many rodents we find hairy patches on the buccal aspect of the cheek. In dogs the buccal mucous membrane contains pigment; this is occasionally the case with the lingual mucous membrane in man, and the vagina sometimes contains tracts of blue pigment in monkeys. Sebaceous glands are not peculiar to skin; they are large and numerous in the mucous membrane of the nymphæ; in rare cases a milk gland may develop in this situation. Mucous glands occur in the skin of batrachians, worms, and as slime glands in fish.

In snails, oysters, mussels, etc., the skin glands secrete a shell; in reptiles, and such specialised vertebrates as birds, the glands in the oviducal mucous membrane perform a similar function; calcareous formations resembling shells are constantly formed by the glands in the prostate of man.

A single layer of epithelium avails little in the argument, for worms have a single layer of columnar epithelium to their skin. Amphioxus is similarly provided in the gastrula stage, the cells being ciliated. It has been urged that the lining membrane of the mouth is practically skin, inasmuch as it is derived from the epiblast, and a great deal has been said that, to render the argument valid, hair should be found on such a typical mucous membrane as that lining the stomach and bowels. This is not very difficult, for that remarkable bird the darter (*Plotus anhinga*) has its pyloric orifice guarded by a tuft of hair (fig. 18). This curious pyloric plug is composed of structures which do not resemble hairs merely in the external appearance, but also in their histology. We should also remember that cutaneous piliferous patches occur on the conjunctiva of men and dogs, and wool on the cornea of sheep.

For a detailed account of this remarkable structure the student should consult the collected works of Garrod (p. 334), "The Anatomy of *Plotus Anhinga*."

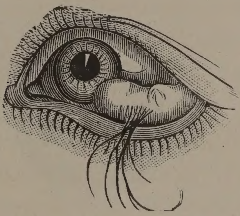

Fig. 19.

Dermoid Growth on the Conjunctiva (after Wardrop).

Thus, of the various structures usually regarded as dermal, we find that they exist in the mucous membrane of various vertebrata. It will, perhaps, be convenient to arrange them in a summary :—

SKIN.—1. *Epidermis.*—Stratified cells cover the buccal aspect of cheeks and lips, and form a thick pad lining the bird's bizzard.

2. *Pigment.*—Occurs in the mouth of dogs, in the mucous membrane of man's tongue occasionally, and in the vagina ot monkeys.

3. *Shell.*—Occurs in the glandular acini of the human prostate

after fourteen years of age. Shell is also formed by the glands in the mucous membrane of the oviducts in the sauropsida and monotremata.

4. *Hair.*—Stomach of the darter, as a pyloric plug; also on caruncle of the eye, and in the mouth of rodents.

5. *Mucous Glands.*—Skin of batrachians, fish, and worms.

6. *Sebaceous Glands.*—Labia minora of the human female.

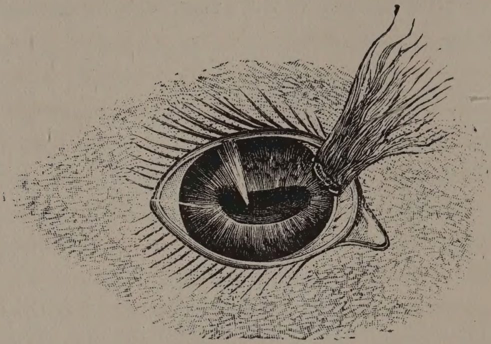

Fig. 20.

Dermoid Growth, with Wool, on the Conjunctiva of a Sheep.

7. *Sweat Glands.*—These are probably modified mucous glands such as occur in the skin of frogs.

Epiblastic Origin.—The mucous membrane of the mouth, pharynx, and conjunctiva is epiblastic.

Thus there is no character or set of structural characters by which we can definitely mark a fundamental distinction between skin and mucous membrane. The supposed embryological distinction that skin is of epiblastic origin, whilst mucous membrane comes from the hypoblast, is often urged very strongly. Yet in the case of the conjunctiva we have a typical mucous membrane derived from epiblastic, which not infrequently declares its fundamental relation to skin by exhibiting upon its surface a larger or smaller patch of true skin. A specimen from man is shown in fig. 19. It was observed in a man aged fifty years. The condition was congenital. Twelve very long hairs grew from its middle, passed between the eyelids, and hung over the cheek. The hairs did not appear until the sixteenth year, when the patient's beard began to grow.* Very many such cases have been placed on record in man. I have collected many examples from other mammals. Thus, a specimen in the museum of the Royal College of Surgeons shows a patch of skin on the cornea of a sheep, from which a long tuft of wool sprouts (fig. 20). Partridge† has described a case which occurred in an ox (fig. 21). Indeed, they are not rare in this animal. Dermoid tracts have also been seen on the conjunctivæ of dogs and horses.

The most useful fact in relation with this matter is that the change from mucous membrane to skin may be actually studied in the human subject. On examining microscopically the covering of an internal pile which has been long extruded, instead of the columnar epithelium characteristic of the rectum, we meet with stratified cells characteristic of the epidermis.

Similar changes occur in connection with the uterus when inverted. Mr. Dickinson informed me that in a negress suffering from elongation of the cervix the part projecting from the vulva was not only skin-like in appearance, but intensely black, like the rest of the integument. But uterine myomata offer the readiest means of demonstrating the change. When a submucous myoma projects into the cavity of the uterus its surface is covered with columnar ciliated cells. Later, when such a tumour projects into the vagina the surface cells become stratified, whilst those lining the glandular recesses of the exposed part retain their columnar ciliated character. This was beautifully shown in some specimens described by Dr. Gervis* before the Obstetrical Society (fig. 22). These cases are of great value, for they decide the unstable nature of opinions as to the genesis of cysts founded merely on the character of the epithelial lining; indeed, epithelium is very variable, especially when subject to pressure.

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* Wardrop, "Morbid Anatomy of the Human Eye."

† Trans. Path. Soc.

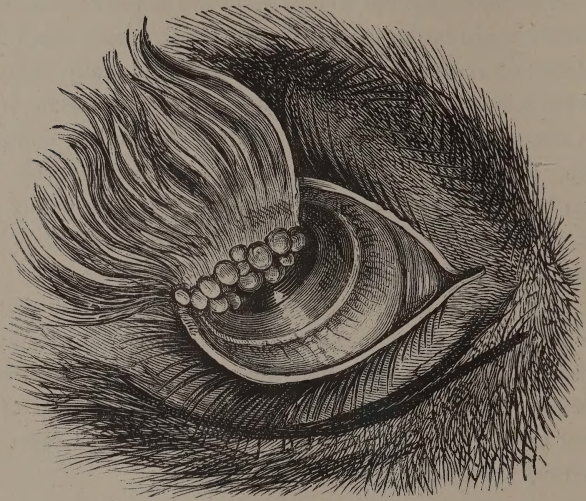

Fig. 21.

The Eyeball of an Ox, with a Piece of Hairy Skin growing from the Conjunctiva (after Partridge).

If we admit the morphological identity of skin and mucous membrane, it necessarily follows that a cyst lined with mucous membrane should, with as much propriety, be admitted into the category of dermoids as one lined with skin, provided they arise in

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* Obstetrical Soc. Trans., vol. xxviii., 1886.

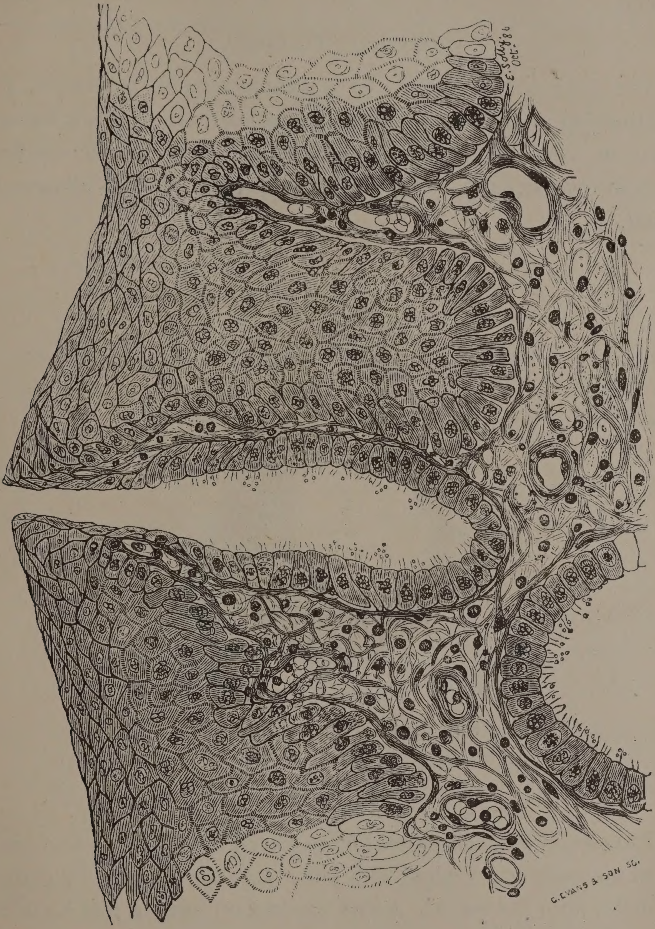

Fig. 22.

Appearance of the Mucous Membrane of a Prolapsed Uterine Fibroid (after Gervis).

situations where skin and mucous membrane do not normally occur.

DERMOID TUMOURS.

The facts considered in the preceding section, concerning the relationship of skin and mucous membrane, are of great importance in connection with an exceptional form of skin-covered tumour occasionally found in certain parts of the alimentary canal.

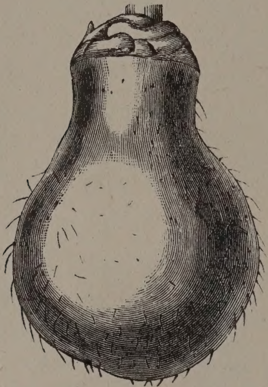

Fig. 23.

A Dermoid Tumour from the Pharyngeal Aspect of the Soft Palate (after Arnold).

In cases of large congenital hairy nævi it is not rare to find small pyriform tumours, covered with piliferous skin, hanging by narrow pedicles from the nævus. A very marked instance of this occurred in a child whom I saw with Mr. Wilkes, of Salisbury : nearly the whole of the trunk was covered with darkly pigmented, hairy skin ; in some parts the hair was as long as that on the child's scalp.

Hanging from the nævus near the spine of the left scapula were two of these pendulous dermoid tumours. Similar pedunculated dermoid tumours occur in the pharynx and rectum. Pharyngeal dermoid tumours may be attached to the back of the soft palate or to the roof of the pharynx, and it appears to be very difficult during life to exactly decide to which part of the pharynx a given dermoid tumour is attached.

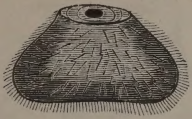

Fig. 24.
A Pilose Pharyngeal Dermoid (after Abraham).

Arnold * has published an excellent description of a dermoid tumour, of the size and shape represented in fig. 23, removed by Schütz, of Mannheim, from the pharyngeal aspect of the soft palate, a little to the left of the median line, of a girl aged thirteen years. The tumour was congenital, and covered with skin furnished with hair and sebaceous glands. The bulk of the tumour consisted of connective tissue, containing striped muscle fibre and cartilage.

Abraham† has described a dermoid tumour removed from the pharynx of a young woman, aged twenty-two; it contained a nodule of cartilage; it grew from the basilar suture (fig. 24).

Dr. Hale White ‡ described a similar specimen, removed from the pharynx of a child, three years old. It was uncertain

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* *Virchow's Arch.*, Bd. cxi., s. 176, 1888.

† *Journal of Anat. and Physiol.*, vol. xv., p. 244.

‡ Path. Soc. Trans., vol. xxxii., p. 201.

whether the tumour grew from the back of the soft palate or roof of the pharynx.

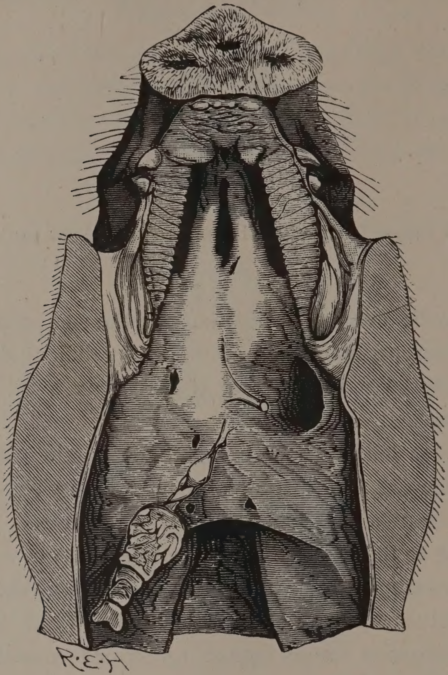

Fig. 25.
A Pharyngeal Dermoid Tumour in a Monstrous Pig.*

Arnold refers to a case reported by Lambl, in which a pedunculated pharyngeal dermoid occurred in a child four weeks old. At the age of six months the dermoid became detached, and swallowed by the child. Next day it passed *per anum.* It consisted of fat and pilose skin.

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* The specimen is fully described in the Trans. Odont. Soc. of Great Britain, Dec., 1888.

The pharynx, like the coccygeal region, is very frequently occupied by teratomata, and occasionally a dermoid tumour may be associated with a pharyngeal teratoma. I once dissected a specimen of this sort in a monstrous pig. The dermoid is shown in fig. 25. It was mainly composed of fibrous tissue, covered with integument beset with soft bristles and glands.

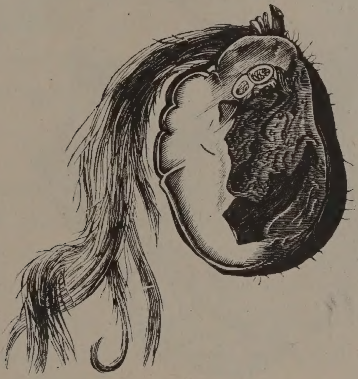

Fig. 26.
A Rectal Dermoid in Section (after Port).

Similar tumours occur in connection with the rectum, but as a rule they are furnished with tufts of hair often of great length. These long locks of hair protrude from the anus, and cause great annoyance and distress.

The case described by Dr. Port * may be selected as a typical specimen of this form of dermoid; it is composed of fat and fibrous tissue, covered externally with piliferous skin, furnished with sebaceous glands and a tooth (fig. 26).

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* Trans. Path. Soc.. vol. xxxii, p. 307.

I have also had an opportunity of examining a very similar case exhibited by Clutton * at the Pathological Society. This also had some tufts of long hair. The tumour was situated near the upper end of the rectum. Danzel † reported a case which occurred in a woman aged twenty-five years. The tumour resembled the two just mentioned, but was said to contain brain substance enclosed in a bony capsule (fig. 27). Such tumours may be attached to the mucous membrane of the bowel, just

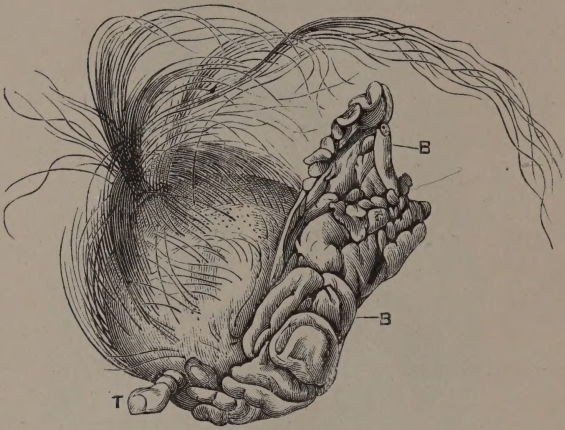

Fig. 27.
A Pedunculated Dermoid of the Rectum (after Danzel).
B B, its point of attachment to the bowel. T, Tooth.

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* Path. Trans., vol. xxxvii., p.

† *Langenbeck's Archiv*, 1874, Bd. xvii.

within the anus, or extend as high as the sigmoid flexure. Some surgeons are of opinion that such tumours originate in the ovary, make their way through the gut, and project into the rectum. Such an explanation has not any evidence to support it. In some instances they probably arise from the transformation of the mucous membrane of the bowel, in the same way as dermoid patches on the conjunctiva, and there is no theoretical reason why a skin-covered tumour should not form in any part of the alimentary canal, from the mouth to the anus. Some of the rectal and pharyngeal dermoids may arise in a somewhat different manner, as will be explained later.

CLASSIFICATION OF DERMOIDS.

Up to the present time little has been attempted towards the classification of this remarkable group of tumours. In the present essay we shall find it most convenient to consider them in three groups, according to their mode of origin; they may arise in sequestrated portions of the surface epiblast, in connection with obsolete canals, and in ovarian follicles. This will enable me to form three groups:—

1. Sequestration dermoids.
2. Ovarian dermoids.
3. Tubulo-dermoids.

Each of these groups will be separately considered. Of the three groups, the simplest in structure are sequestration cysts, the largest, most complex, and dangerous to life are the ovarian forms, whilst tubulo-dermoids occupy an intermediate position in each respect.

CHAPTER III.

SEQUESTRATION DERMOIDS.

Dermoids belonging to this group arise in detached or sequestrated portions of the surface epiblast, chiefly in situations where during embryonic life coalescence takes place between two surfaces possessing an epiblastic covering. Under this heading we may conveniently include the interesting variety "dermoids by implantation." The cysts of this group are the simplest dermoids, and may be considered according to the situation in which they grow :—

1. In the Trunk.
2. On the Head.
3. Iritic Dermoids.
4. Implantation Dermoids.
    (*a*) Limbs.
    (*b*) Iris.

I. DERMOIDS OF THE TRUNK.

Sequestration dermoids arising in connection with the trunk occur strictly in the regions where the opposite halves of the body wall coalesce. These lines of coalescence may be indicated in the adult by a line starting from the external occipital protuberance, and extending along the mid-line of the back to the coccyx ; it then passes through the perinæum (scrotum, and penis, in the male), upwards through the umbilicus, thorax, and neck, to the symphysis menti.

(*a*) *The Dorsal Group.*—Dermoids associated with the spine are very rare. For an opportunity of examining the following specimen I am indebted to the kindness of Mr. Gilbert Barling. The parts were removed from a child two years old, the subject of *spina bifida occulta.* Beneath the hairy patch, and associated with the defective spines, a small dermoid cyst was found (fig. 28), containing pultaceous material and hairs.

I long had a suspicion that many tumours described as spina bifida cysts may have been dermoids, for, theoretically, dermoids should occur with tolerable frequency along the dorsal line. To this end I made a microscopical examination of a large number of spina bifida cysts which were in my possession and under the charge of my friends, as well as those preserved in the museum of the Royal College of Surgeons, but without success. Recently Dr. Wilde described before the Pathological Society a large dermoid removed by Mr. Holthouse from the lumbo-sacral region of a man aged twenty-two years. The cyst was congenital, as large as a turkey's egg, and lined with skin, furnished with hairs and possessing tactile sensibility. This I verified by personal observation.

Faulty coalesence is by no means uncommon in the lumbo-sacral region, as is attested by the occurrence in association with and not infrequently without, a spina bifida cyst of small congenital sinuses known as post-anal dimples, erroneously attributed by Cleland to abnormal shortness of the notochord.

(*b*) THE VENTRAL GROUP.—*Scrotal Dermoids.*—There are many good reasons for believing that the majority of dermoids reported as being testicular were really scrotal. This was clearly so in a case reported by Bilton Pollard* as a dermoid of the testicle. The cyst was situated on the left side of the scrotum, between the testicles, and was adherent to the back of the left one, outside the tunica vaginalis. The cyst contained putty-like material in which there were a few grey hairs; three hairs were found growing from the cyst wall. The cyst was lined with stratified epithelium; papillæ and sebaceous glands were detected.

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* Path. Soc. Trans., vol. xxxvii., p. 342.

It is usually stated in text-books that dermoids of the testes are common. This is very improbable, for very few cases are to be found in surgical literature, and then the details in most cases are insufficient to enable me to determine whether the dermoid was scrotal or testicular. For evidence as to the rarity of testicular dermoids Mr. D'Arcy Power's* paper should be consulted.

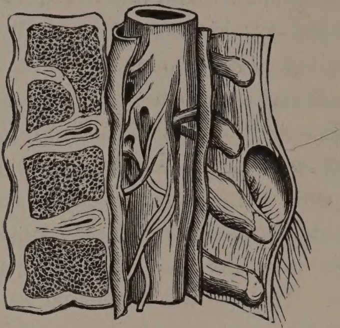

Fig. 28.
Section of a Portion of a Spine with *Sp. Bif. Oc.*
D, a small Dermoid (Semi-diagrammatic).

This furnishes a good example of the small amount of reliance to be placed on loosely recorded descriptions of specimens. In records of future cases it will be necessary to pay particular attention to the relation the dermoid bears to the testicle, tunica vaginalis, and scrotum.

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* Path. Soc. Trans., vol. xxxviii., p. 224.

(*c*) *Penile Dermoids.*—As is well known, the penis is formed by the union of two lateral moieties, the line of confluence being indicated in the adult by the prominent median raphé so conspicuous on its under aspect. Thus, we may anticipate the occasional existence of dermoids in this situation; they are nevertheless very rare. It is likely that some cysts occurring on the under aspect of the penis near the prepuce, and described as dermoids, may have been sebaceous, whilst some described as sebaceous were really dermoids.

(*d*) *Umbilical Dermoids.*—The umbilicus is not a common situation in which to find dermoids. Lannelongue * has given a careful description of one which hung pedunculate from the navel of a child eight years old. The tumour had been noticed since the age of three. The cavity of the dermoid contained pultaceous matter, and the walls, when examined microscopically, exhibited the characters of skin, but glands and hairs were not found. A drawing of the histological features accompanies the description. One of the most remarkable specimens of dermoids known is described by Budin, † which was found attached to the umbilical cord of a girl; it was as big as a large fist, and was situated twenty centimetres from the umbilicus. The interior of the cyst possessed an epithelial lining, hairs, and sebaceous glands.

Dermoids in the Mid-line of the Thorax and Neck.—Along this line dermoids are most frequently seen in relation with the manubrium sterni, at the spot known as the *angulus Ludovici.* Here they may attain goodly proportions, and dip behind the manubrium to invade the superior mediastinum. They may occur on the ventral (anterior) aspect of the sternum unconnected with the *angulus.* An easily accessible description of a case of this nature is furnished by Clutton.* The patient was a female aged thirty-nine years. She had a tumour, 13 inches in circumference, pendulous between the breasts. The tumour, when removed, contained 11 ounces of the usual pultaceous material found in dermoids. The cavity was lined by skin, but no glands were found. Only one hair was detected growing from its walls. When the patient was six weeks old a small body the size of a pea was noticed; at nineteen it was as large as a hen's egg; since that age it increased in size rapidly. Cysts in this situation are very rare. Judging from the few recorded cases, sternal dermoids are most commonly situated over the interspace between the manubrium and gladiolus.

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* "Kystes Congénitaux," p. 196.

† *Le Progrès Médical*, Dec. 31, 1887.

Numerous examples of dermoids in the mid-line of the neck, near the hyoid bone, have been reported.

II. Cranial Dermoids.

Sequestration dermoids occurring in the head are divisible into two distinct groups; viz., those arising in connection with the facial fissures, and those found on the scalp or in relation with the dura mater. The fissures connected with the face occasionally occupied by dermoids are the orbital and palatine, and the choroid cleft of the eye.

Orbital Dermoids.—The outer and inner angles of the orbits are, next to the ovary, the most frequent situations in which to find dermoid cysts. Indeed, their characters are so well known as to scarcely need a description. They are more common at the outer than the inner angle of the orbit, and as a rule they rarely exceed the dimensions of a filbert. The cavity of the cyst contains pultaceous matter and hair; the cyst wall is covered with epidermis, presenting hairs and large sebaceous glands, but rarely sweat glands. Teeth, I believe, have never been found in these orbital cysts. Usually they are lodged in a shallow recess in the bone, and not infrequently have a pedunculated connection with the dura mater. The general appearance of such a cyst is shown in fig. 29.

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* Path. Soc. Trans., vol. xxxviii., p. 393.

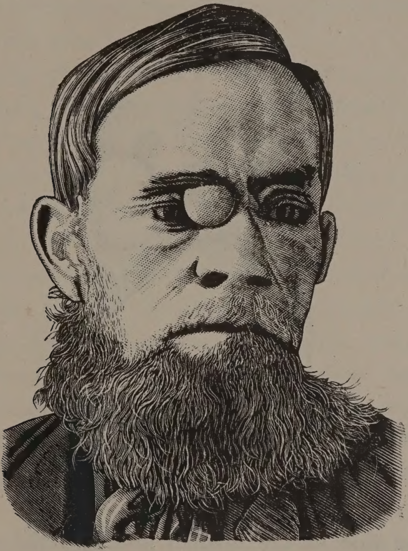

Fig. 29.
An Orbital Dermoid.

This specimen is somewhat unusual, in that the patient was a middle-aged man. As a rule they are removed early in life. In actual practice it is necessary to avoid confounding a meningocele in this situation with a dermoid, or serious consequences may ensue.

Dermoids in the vicinity of the orbital angles are regarded as arising from portions of the surface epiblast sequestrated during the process of obliteration of the orbital fissure, shown in fig. 30, which cleft is represented in the adult by a line drawn from a spot about half an inch behind the external angular process of the frontal bone, through the orbit, and following the lachrymal canal, passes through

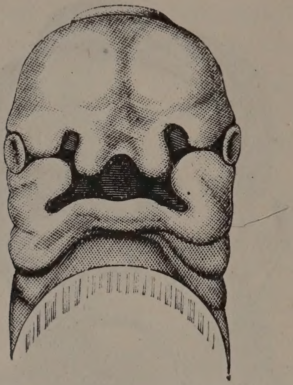

Fig. 30.
Ventral View of the Mouth of a Human Embryo, showing the Orbital Fissure.

the lip, to one side of the median line, into the mouth. The nasal duct represents a persistent portion of this cleft. It is not justifiable to apply the term branchial to this fissure, although there are many reasons to lead us to suppose that at one time it may have supported gills; nevertheless, the arguments are not altogether convincing, and at the present day no forms are known in which at any time gills sprouted into the cleft.

Although many orbital dermoids may be satisfactorily regarded as arising in portions of surface epiblast sequestrated during the obliteration of the orbital fissure, the explanation does not satisfactorily account for all dermoids in connection with the orbits.

On several occasions I have removed dermoid cysts from the eyelids unconnected with bone or periosteum, and situated in the palpebral tissues. The eyelids are occasionally subject to a malformation known as coloboma: the upper lids are affected more often than the lower, and the malformation may be unilateral or bilateral; not infrequently the defect is accompanied by hare-lip, cleft palate, and similar conditions.

Our knowledge of the details of the development of the eyelids is not very exact, certainly not sufficient to enable us to offer a satisfactory account of the mode of origin of such a defect as coloboma palpebrarum. I have little doubt that when a satisfactory account is forthcoming we shall probably find the key to the origin of many dermoid cysts lying in intimate relation with the eyelids, unassociated with bone and the orbital fissure.

Cysts of the Choroid Cleft.—Cysts, variously described as sebaceous and dermoid, growing on the iris, may arise in two ways. The majority of such cysts have been associated with antecedent perforating wounds of the cornea, whereby small pieces of Descemet's membrane, epidermal scales, or eyelashes have been accidentally transplanted on to the iris and formed the germs of cysts.

Mr. Osborn* admits that many iritic dermoids and sebaceous cysts arise in this way, but suggests that others may occasionally be due to dilatation of some portion of the unobliterated remains of the choroidal cleft, which when persistent gives rise to the defect known as coloboma iridis. Such cysts look like small white currants, semi-transparent and pearly, protruding into the anterior chamber, occluding the pupil, and eventually inducing an attack of iritis.

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* St. Thomas's Hospital Rep., vol. vi., p. 69. R. Lond. Ophth. Hosp. Rep., vol. vii., p. 245.

Osborn also relates a case in confirmation of this view, where a cyst of the iris was associated with a dermoid in front of the pinna, a little above the tragus.

Masse * has published some evidence which strongly supports Osborn's view. Iritic cysts are of rare occurrence, and are among the most striking and beautiful pathological specimens when seen in the living eye.

Dermoids of the Pinna.—The pinna is first indicated in the human embryo by six ill-defined tubercles, which arise on each side of the hyo-mandibular cleft; their subsequent fusion gives rise to the pinna.

Should any of these tubercles fail to coalesce, various defects are occasioned, such as congenital fistulæ and supernumerary auricles; if pieces of the surface epithelium get locked in a dermoid may arise † (fig. 31).

Palatine Dermoids.—Originally the roof of the mouth is incomplete, the nasal and buccal cavity forming a common chamber. Gradually the palatine processes of the maxillæ and palate bones converge to the middle line to form a roof to the mouth. For a long time, however, the palate is occupied by a fissure, extending originally through the upper lip; it is for a time restricted to the hard and soft palate, and finally closes from before backwards. Cysts and tumours arising from faulty closure of this fissure or cleft are of two kinds—*epithelial pearls* and *dermoids.*

When the mouth of a child at birth is examined it is not unusual to find in the median raphé of the palate, and sometimes hanging by thin, short pedicles, small pedunculate bodies of the size of millet seeds, sometimes as large as peas, composed of epithelial cells. The small bodies are known as epithelial pearls, and are to be regarded as remnants of the cells which covered the opposed surfaces of the palatine elements, which growing from each side, meet together in the median line to form the roof of the mouth. Small collections of epithelial cells of this character have been seen in the raphé on the under aspect of the penis. For references to a discussion on the nature of the epithelial pearls the student may consult Leboucq's paper.* These little bodies are of some interest, for they may be regarded in the light of tumour germs. Neoplasms perfectly innocent in their nature, but full of epithelial nests, occur in the palate, and good ground exists for the belief that many palatine tumours described

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* "Kystees, Tumeurs Perles, et Tumeurs Dermoides de l'Iris," Paris, 1885.

† For fuller details see *Lancet,* Feb., 1888.

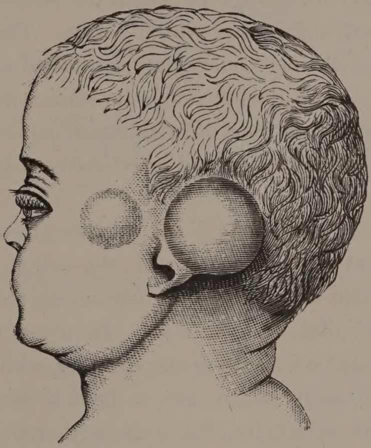

Fig. 31.

A Dermoid of the Pinna associated with one in the Orbital Fissure (after Lannelongue).

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* "Note sur les Perles Epithéliales," *Arch. de Biologie*, vol. ii., 1881, p. 400.

as adenomata were really of the same nature as epithelial pearls. For a careful account of the characters and structure of these neoplasms reference should be made to the papers of Stephen Paget,* who has reported some cases and collected the more important in surgical literature.

Dermoids of the palate have several times been seen, and as a type specimen that reported by Clerault † may be selected:—

"A male infant was born with a tumour inside its mouth which was at first mistaken for a tongue, being of the same colour and consistence. The soft palate was partially cleft. The tumour grew from the middle of the hard palate, and was lobed and covered with silky hairs, especially on the left side. Its surface was covered with true skin, with large sebaceous glands, but no papillæ; inside it was composed of adipose tissue, with a fasciculus of striped muscular fibre."

Dermoids of the Scalp and Dura Mater.—Dermoid cysts are occasionally found in connection with the scalp and dura mater. The usual situations are the anterior fontanelle, root of the nose, and external occipital protuberance. In these situations they may be confounded with sebaceous cysts or with meningoceles. Dermoids of the scalp nearly always have a thin pedunculated attachment to the dura mater, the pedicle traversing a hole in the underlying bone, unless the cyst is over a fontanelle.

Arnott‡ published the details of an instructive case of dermoid situated over the anterior fontanelle in an infant a few days old. The tumour exactly resembled a meningocele, "rising and falling with regular pulsation, and swelling when the child coughed;" the resemblance was so strong that it was treated as a meningocele.

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* Paget, "Tumours of the Palate," St. Barth. Hosp. Rep., vol. xxii., and Path. Soc. Trans., vol. xxxviii., p. 348.

† *Bull. Soc. Anat.*, 1874, p. 380.

‡ Path. Soc. Trans., vol. xxv., p. 228.

A few weeks later the child died from broncho-pneumonia, and the cyst was found to be a dermoid. The specimen is preserved in the museum of St. Thomas's Hospital.

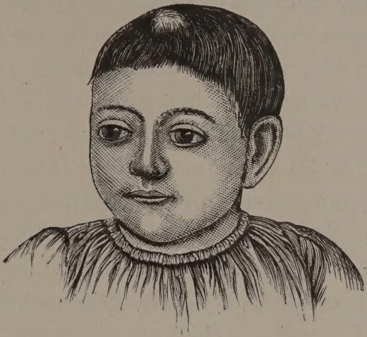

Fig. 32.
A Congenital Tumour over the Anterior Fontanelle (after Hutchinson).

Giraldés * records a case even more remarkable than this. A child, three months old, had an ovoid tumour, of the size of a pigeon's egg, over the anterior fontanelle. The tumour was covered with fine white hair, and did not pulsate with respiration. It was thought to be a meningocele, and in order to establish a diagnosis it was punctured with a fine trocar, and fluid resembling that found in meningoceles was withdrawn. Notwithstanding numerous subsequent punctures, the tumour maintained its original volume. Some months later it was removed, Giraldés being still under the impression that it was a meningocele, but it was found to be a typical dermoid.

The clinical characters of such tumours occurring at the

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* "Maladies Chir. des Enfants," p. 342.

anterior fontanelle may be illustrated by the case reported by Hutchinson.* As the tumour distinctly filled when the child cried, it was not interfered with. At the date when the case was published the patient was a fine young man of eighteen, and the cyst has not shown any tendency to increase since birth (fig. 32).

Some of the most striking specimens of dermoid cysts are those found associated with the dura mater, but situated on the inner side of the bony covering. A frequent position for such cysts is in the immediate neighbourhood of the torcular Herophili. Careful descriptions of at least four cases are accessible. Professor Turner † described a dermoid cyst of small size situated between the layers of the dura mater beside the torcular. It contained hair, and was unassociated with any defect of the occipital bone. It occurred in a child aged twenty-three months. Dr. Ogle ‡ observed a similar case in a child two years and a half old, associated with a defect in the squamous portion of the occipital bone.

Dr. Pearson § Irvine published the details of a cyst which he found in a child seven years old. The cyst had invaded both lobes of the cerebellum, and had injuriously affected the medulla and upper part of the spinal cord. The cyst contained hair, sebaceous matter, and pus; inflammation and suppuration had occurred.

Lannelongue || has figured a specimen of this nature. The patient was a little girl whose head began to enlarge at the age of three years; at the age of seven her head presented all the

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* "Illustrations of Clinical Surgery," vol. ii., plate xlvi.

† St. Barth. Hosp. Rep., vol. ii., p. 62.

‡ *Brit. and For. Med. Chir. Rev.*, 1865.

§ Path. Soc. Trans., vol. xxx., p. 195.

|| "Kystes Congenitaux," 1886. The details of this case were communicated to the Soc. Anat. by Wedal (1885).

characters of hydrocephalus, and she suffered from vomiting, giddiness, and convulsions. Paralysis, amaurosis, and coma gradually supervened, and at the age of seven years and a half she died. On examining the parts the ventricular cavities and intercommunicating passages were found greatly distended. Projecting into the space between the cerebellar lobes was a cyst of the size of an orange, which had depressed the roof of the fourth ventricle and obliterated the underlying cavity.

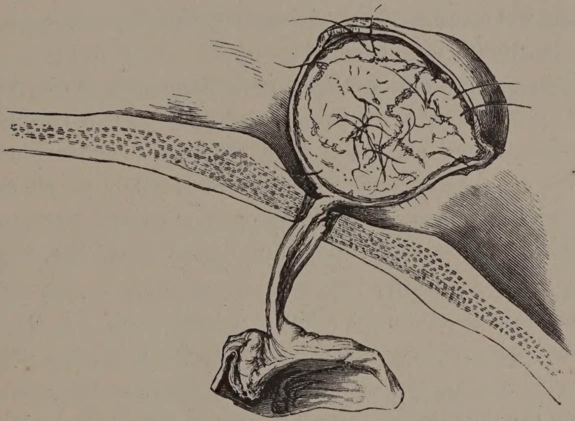

Fig. 33.
A Dermoid of the Scalp connected with the Dura Mater by a Pedicle.

The cyst contained sebaceous matter and epithelial scales; the walls were lined with several layers of epithelium, and externally were adherent to the tentorium cerebelli, whilst a portion passed out of the skull immediately beneath the occipital protuberance, and was adherent to the overlying scalp.

Thus dermoids presenting on the scalp may or may not have pedicles of attachment to the dura mater, whilst intra-cranial dermoids connected with the dura mater may or may not have pedicles of attachment with the scalp.

Although at first sight a dermoid cyst connected with the dura mater and projecting into the brain seems to violate all embryological rules, nevertheless, when we view this membrane from a morphological standpoint the strangeness vanishes and a satisfactory explanation is forthcoming.

Morphologically considered, the bony framework of the skull is an additional element to the primitive cranium ; this is represented by the dura mater, and as I have elsewhere* endeavoured to show, the term extra-cranial should strictly apply to all tissues outside the dura mater. In common practice we find it convenient to regard the bones as the boundary of the skull, but morphologically this is inaccurate ; the skull-bones must be regarded as secondary cranial elements. Early in embryonic life the dura mater and skin are in contact; gradually the base and portions of the side-wall of the cranium chondrify, thus separating the skin from the dura mater. In the vault of the skull, membrane bones develop between the dura mater and its cutaneous cap, but the skin and dura mater are long in contact along the various sutures even for a year or more after birth. This relation of the dura and skin persists longest in the region of the anterior fontanelle and the neighbourhood of the torcula. Should the skin be imperfectly separated, or, indeed, a portion remain persistently adherent to the durà, it would act precisely as a tumour-germ, and give rise to a dermoid cyst. Such a piece of skin may retain its old attachment to the dura, and its pedicle becoming surrounded by bone, the cyst resulting from it would lie outside the bone, but be lodged in a depression on its surface, with an aperture transmitting its pedicle. On the other hand, it may become buried in by bone; the cyst would then project exclusively on the inner surface or between the layers of the dura. If this view of the origin of dermoids of the scalp be admitted, we must then slightly modify our teaching, and say that the depressions in which dermoid cysts of the cranium are lodged arise as imperfections in the developmental process, and are not due to absorption induced by the pressure exerted by the cyst; further, the fibrous connection of such dermoids with the underlying dura is primary and not secondary.

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* *Journal of Anat. and Physiology*, vol. xviii., p. 28, "A Critical Study in Cranial Morphology."

III. DERMOIDS OF THE LIMBS.

These form a very interesting group, for we may regard them in the light of an experiment which affords good evidence in support of the view that sequestration dermoids arise in detached portions of surface epiblast.

The cysts which will be here described as dermoids of the limbs have in most cases been reported as sebaceous cysts; they are extremely rare, and in nearly all instances associated with antecedent injury. Thus, in one of best-described cases the facts were as follow * :—

A cyst, the size of a small cherry, was removed from the finger of a man who some years before had injured his right middle finger, the terminal phalanx of which was amputated in consequence. The cyst, which lay under the skin and rested upon the sheath of the flexor tendons, on the palmar aspect of the proximal phalanx of the injured finger, was composed of a layer of fibrous tissue, supporting a stratum of

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* Barker, Path. Soc. Trans., vol. xxxvii., p. 478.

irregular epithelial cells, and lastly a layer of horny epidermis, lining a cavity containing sebaceous material and cholesterin.

In another case a man pricked his finger with a piece of steel in the flexure of the joint; a small nodule appeared at the injured joint; this was removed, and found to consist of densely packed epithelial scales. Mr. Poland,* in reporting these facts, mentions that Mr. Davies-Colley had removed two similar cysts from the finger, both associated with antecedent injury. Mr. Bowlby reported a cyst of this nature removed from the dorsal surface of the index-finger. The patient, a woman aged sixty, had frequently pricked the finger at that spot with a sewing-needle.

It would seem that at the time of the accident small particles of skin or epidermis are carried into the tissues by the instrument which inflicts the wound, and behaving as grafts, become the starting-points of dermoids.

Polaillon † has given an account of digital dermoids, and gives to M. Muron the credit of first recognising the character of such cysts (1868). He says the tumours are more frequent in the palmar than the dorsal aspect of the digits, but he fails to associate them with antecedent injury, though he distinctly points out that they occur mainly on the hands of workpeople and soldiers.

A digital dermoid from the subcutaneous tissue of the finger pulp is represented in fig. 34. The specimen was placed at my disposal by Mr. Shattock, who described its microscopical characters thus: "It appeared as if a piece of the skin covering the pulp of the finger had been inverted." There was no clear history of old mechanical injury, but the patient was a farrier. Cysts of this character are not confined to the digits. Mr.

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* Path. Soc. Trans., vol. xxxv., p. 399.

† "Dic. Ency. des Sci. Méd.," 1884, in an admirable article, "Doigt."

Targett recently exhibited at the Pathological Society a very large dermoid removed from the subcutaneous tissue on the outer side of the knee-joint, near the insertion of the biceps. The cavity contained the usual pultaceous material peculiar to dermoids. Under the microscope the lining membrane was found to be skin, but no cutaneous appendages were detected. In the clinical notes, which were taken six years ago, no history of injury was recorded.

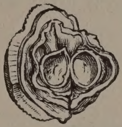

Fig. 34.
A Dermoid from the Pulp of the Finger, natural size.

Dermoids by "implantation" are of interest, for they serve to throw light on some cysts containing hair and wool, preserved in the museum of the Royal College of Surgeons. Two of the cysts are from sheep, and contain wool embedded in fatty matter. Unfortunately, the catalogue affords no information as to the region of the body from whence they were removed. The third and fourth specimens were removed from the shoulder of a cow which had six legs. The cysts contain light hair, fatty and calcareous matter. These four specimens are *Hunterian*. The fifth specimen was removed from beneath the integuments of the shoulder of an ox. It contained slender black hair, resembling those on the skin of the animal, mixed with fat. These cysts served for a time to puzzle me, because at the shoulder we have no embryonic lines of coalescence. In the cow from which the third and fourth cysts were removed we have, it is true, a malformation, viz., two supernumerary legs, in association with the cysts, but the details are too meagre to allow of any safe inferences being drawn; besides, this will not explain the cysts in the sheep and ox. Fortunately, these cysts can be explained on the same lines as dermoid cysts of the fingers in man. The sticks used by cattle-drovers are armed at the end with a sharp iron spike, an inch long, with which they "prod" the beasts, often very severely. It may be assumed that punctures produced with such an instrument may lead to the deposition of dermal grafts beneath the skin, which may give rise to dermoids, in the same way as punctured wounds in the skin of men and women. Punctured wounds in sheep and oxen may be caused by projecting nails, iron spikes, tenter-hooks, and the like.

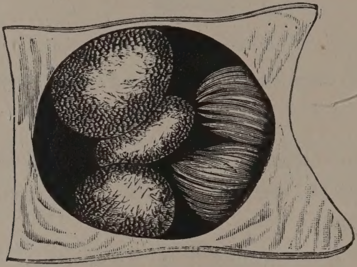

Fig. 35.
A Dermoid Cyst from the Back of a Cow (Museum, Royal College of Surgeons).

The opinion that dermoids may arise in the subcutaneous tissue by implantation receives the strongest possible confirmation from what we know of similar cysts of the iris associated with mechanical injury. Those arising in the choroidal fissure have been already described.

IV. IRITIC DERMOIDS.

Cysts of the iris are of comparative rarity, generally appearing as transparent vesicles situated on its anterior surface. As a rule, they are sessile, but occasionally possess a pedicle. The contents may be opaque, but in exceptional cases they have been filled with sebaceous material, such as fills the cavities of dermoids.

Mr. Hulke * has collected some valuable facts in relation to such cysts, and states that in fifteen out of nineteen cases, as well as in two reported by himself, there was distinct history of antecedent mechanical injury. This, especially punctured wounds, suggested to him that in some instances perhaps the cyst originated from portions of Descemet's membrane, which may have been torn from the cornea and implanted on the iris. Mr. Power mentioned to me the case of a sailor who wounded his cornea with a knife; subsequently a small cyst was found on the iris, with an eyelash sprouting from its middle. On this head we have the accumulated experimental observations of Dooremaal, Goldzieher, Schweninger, Zahn, and Masse, who introduced various kinds of tissue, such as cartilage, hairs, and conjunctiva, into the anterior chambers of rabbits. In very many instances the transplanted tissues grew; in others they were absorbed or extruded from the globe.

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* "On Cases of Cysts of the Iris." R. Lond. Ophth. Hosp. Rep., vol. vi., 1869; also Hosch, "Ex. Studien über Iriscysten," *Virch. Arch.*, Bd. xcix., s. 449.

CHAPTER IV.

THE INTESTINAL ORIGIN OF THE CANAL OF THE CENTRAL NERVOUS SYSTEM.

Last year I attempted to show from embryological and pathological data that the central canal of the spinal cord may be regarded as a disused segment of the primitive alimentary canal.

Nearly three years ago I ventured to state, notwithstanding that we were absolutely in the dark concerning the significance of the central canal of the cord, it was justifiable to regard it as an obsolete canal, basing this opinion on the ground that it behaved itself like functionless ducts and passages in general, and at times formed cysts.

It gave me considerable satisfaction to hear Dr. Gaskell express, before the Anatomical Society of Great Britain (assembled at Cambridge in June, 1888), the opinion that the tube which primarily represents the central nervous system in the vertebrate embryo must be regarded as a disused segment of the primitive alimentary canal. Dr. Gaskell had arrived at this conclusion from quite a different mode of working in that adopted by me: it is of interest and importance that two men working independently and in different directions should arrive at fundamentally the same conclusion, although, as may be anticipated, there is some difference in minor details.

As far as I am aware, nothing in any way approaching this somewhat startling conclusion has ever been suggested; excepting, perhaps, the unsatisfactory attempt of Owen,* who supposed that the gullet of ancestral vertebrates passed through the third ventricle, and that the space from the pineal to the pituitary bodies, by way of the infundibulum, represented this primitive or invertebrate (cephalopodic) gullet.

Dohrn † also put forward the view that the fourth ventricle is the place where the œsophagus may be supposed to have pierced the nervous ring.

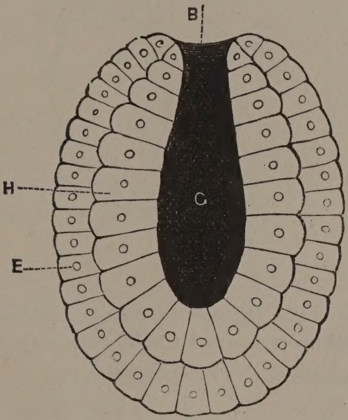

Fig. 36.

A Diagram representing the Gastrula. E, Ectoderm (Epiblast). H, Endoderm (Hypoblast). G, Archenteron. B, Blastopore.

Invertebrates are distinguished embryologically from the majority of vertebrates by the fact that in the early stage of development they undergo a process termed invagination, whereby a portion of the outer wall of cells is depressed in such a way as to give rise to a double-walled cup (fig. 36). This is the gastrula stage, and represents temporarily the double-layered condition permanent in many invertebrata. The hollow, A, in the gastrula is the archenteron, the primitive digestive cavity; the cells lining it constitute the endoderm (hypoblast); the outer wall is the ectoderm (epiblast); the two layers become continuous at the edges of the blastopore. It should be mentioned that the gastrula stage occurs in amphioxus as in invertebrata, and has been detected in the ova of some fish and amphibia.

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* "On the Conario-hypopophysial Tract," *Journal of the Linnean Society*, 1883, p. 131.

† "Ursprung der Wirbelthiere," etc., Leipzig, 1875.

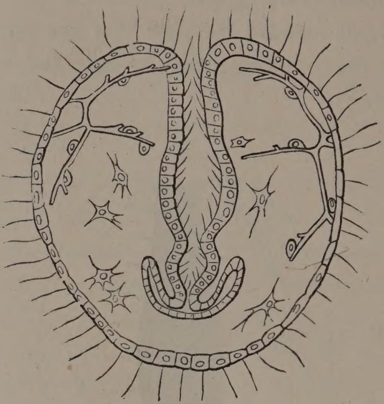

Fig. 37.

Transverse Section of the Embryo of *Echinus Miliaris*, to show the origin of the Pleuro-peritoneal Cavity (Cœlom) from the Primitive Alimentary Canal. (After Selenka.)

Ingenious attempts have been made to identify the occurrence of something which in the higher vertebrates corresponds to the gastrula stage of invertebrates, for the intimate connection of the embryological processes throughout the animal kingdom strongly suggests the occurrence of the gastrula in a modified form, even in the highest mammals. Up to the present time nothing satisfactory has been advanced in this direction. The views which I shall now endeavour to express were forced upon me whilst investigating the mode of origin of those singular ovarian tumours known as dermoids.

It has long been customary to regard the cœlom (pleuro-peritoneal cavity) as a dependency of the vascular or lymph system, but the investigations of the Hertwigs* show this view of the matter to be untenable; it is, on the contrary, a derivative of the archenteron; each pleuro-paritoneal cavity, for they are at first

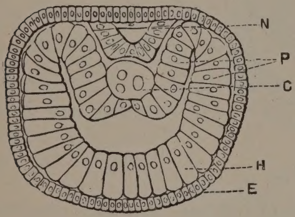

Fig. 38.

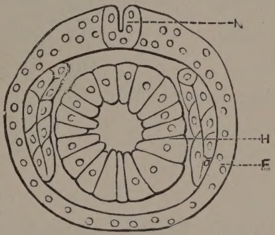

Fig. 39.

Transverse Section of the Embryo of *Amphioxus*, showing the Abstrictions of the Primary Alimentary Canal which form the Cœlom. (After Kowalevsky.)

Transverse Section of a *Polygordius* Larva, to show the relation of the Alimentary Canal and the rudiments of the Cœlom. (After Hatschek.)

C, Notochord. P, Cœlomic Epithelium. H, Hypoblast. E, Epiblast.

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* "Die Colomtheorie," Jena, 1881.

quite separate, arises as a diverticulum from the central cavity of the archenteron, as represented in fig. 37. The central portion persists as the permanent alimentary canal, whilst the lateral diverticula converge ventrally and coalesce to form a common chamber.

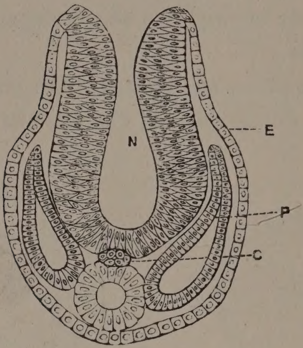

Fig. 40.

Transverse Section through the Head of an Embryo Dog-fish, showing the parts representing the Gastrula Cavity. (After Balfour.)

N, Neural Furrow. E, Epiblast. C, Notochord. P, Peritoneal Epithelium.

These relations of the cœlomic diverticula are well shown in the embryo of amphioxus (fig. 38), where we find the parts represented in transverse section.

A later stage is indicated in a transverse section of a *Polygordius* larva (fig. 39); here the abstriction is complete. Later in *Polygordius* these abstrictions converge ventrally, but remain separated by a thin septum.

In order to render the view more conclusive in its relation to vertebrata, a transverse section through the head of an embryo dog-fish is given in fig. 40.

This view of the nature of the cœlom is of great importance from a pathological standpoint, because it clearly indicates that the cells lining the peritoneum are truly epithelial and of hypoblastic origin, and this applies to the epithelium lining the recesses of glands derived from the primitive pleuro-peritoneal (cœlomic) epithelium. Embryologically it is also important, as it tends to show that the peculiar manner in which the cœlom arises in most mammals, viz., as a schizocœle, must be regarded as a secondary or modified form of invagination, and represents only a portion of the gastrula stage of invertebrata.

We may now turn our attention to the space in the gastrula which lies between the blastopore and the wall of the tube we have just been considering. In vertebrata one of the most conspicuous structures in the early embryo is the notochord, concerning which a great deal of discussion has been carried on at various times as to which of the germinal layers it is derived

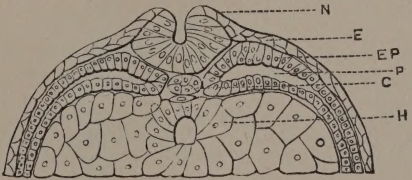

Fig. 41.

Transverse Section of a Three-days' Embryo of *Triton Tæniatus*, showing the Cœlom arising as a Schizocele. (After Hertwig.) N, Medullary Folds. E, Notochord. E, Epiblast. Ep, Peritoneal Epithelium. H, Hypoblast.

from. Morphologically, its most conspicuous features are its close association with the alimentary canal and relation to the spinal cord.* If we glance at the gastrula of *Echinus miliaris* we find that by approximating the edges of the archenteron at the point N we should produce a thickening, and divide the cavity into a dorsal and ventral section, the part below corresponding to the bowel and cœlom, and the parts on the dorsal aspect would represent the medullary folds of the vertebrate; now occlude the blastopore, and we at once give rise to an arrangement of parts corresponding in longitudinal section to the disposition of parts seen in the early vertebrate embryo, and in longitudinal section would furnish us with the fundamental **U**-shaped tube from which

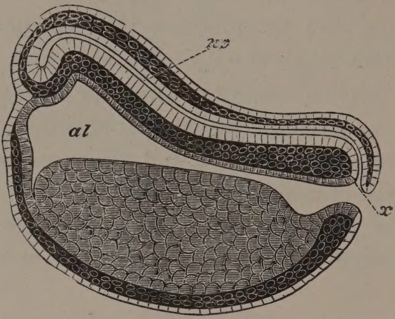

Fig. 42.

Longitudinal Section of an Embryo of *Bombinator Igneus*, to show the relation of the Neural and Alimentary Canal. (Modified from Gœtte.)

nc, Neural Canal. *al*, Alimentary Canal.

* I omit for the present any reference to the sub-notochordal rod which is more intimately connected with the gut than is the notochord.

the vertebrate and brain, cord and alimentary canal are derived (figs. 42 and 44). Before proceeding to discuss the ontogeny of these parts, it may be mentioned that one of the advantages which will follow this view of the matter is that it furnishes an evolutional definition of hypoblast, viz., that the epithelium lining the cavities derived from the archenteron is hypoblastic. This will include the epithelium of the central canal of the nervous system from the infundibulum of the third ventricle to the extremity of the cord, that lining the neurenteric passage, the alimentary canal as far upwards as the junction of œsophagus with the pharnyx, the epithelium of the air passages from the trachea downwards, and that lining the pleuro-peritoneal cavities and of the organs derived therefrom.

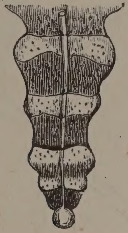

Fig. 43.
Coccygeal Body.

The embryological evidence now at our disposal enables us to represent the primitive alimentary canal as a **U**-shaped tube lined with a continuous layer of columnar epithelium. Each limb ends at the cephalic extremity in a *cul-de-sac.* The ventral limb is widely open to the yolk sac; the flexure of the tube is occupied by the notochord and sub-notochordal rod (fig. 44).

The subsequent events in the ontogeny of these structures is interesting. The limb connected with the yolk sac may, for convenience, be divided into two sections—the fore and hind gut.

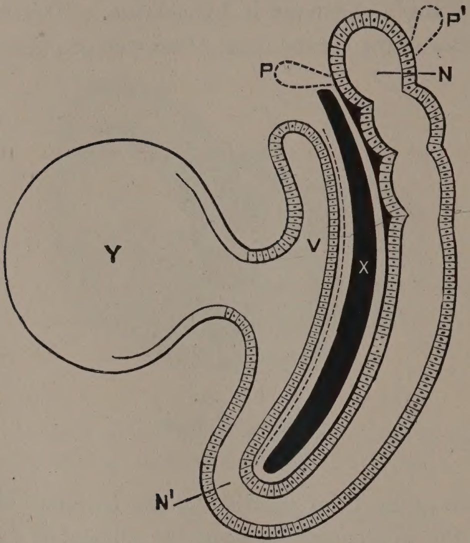

Fig. 44.

The Alimentary Canal and Central Nervous System of a Mammal at the Date of the Closure of the Dorsal Groove.

P, Infundibulum. P', Pineal Diverticulum. N¹ Neurenteric Passage. X, Notochord. Y, Yolk Sac. M, Vitello-intestinal Duct.

The anterior end of the fore gut becomes connected with the exterior by an epiblastic involution—the stomodæum, which not only opens up the cephalic end of the gut, but has close relationship with the cephalic end of the dorsal or neural tube by a diverticulum, the pouch of Rathké, which comes into union with the infundibular diverticulum from the primary encephalic vesicle. The coalescence of the stomodæum and fore gut results in the establishment of a communication between the pharynx and œsophagus.

An involution next appears in the caudal region—the proctodæum—which coalesces with the tube and establishes a nether opening—the anus. The remaining section of the primary tube on the ventral aspect of the notochord is known as the post-anal gut, represented in the adult by Luschka's gland (fig. 43), whilst the segment joining the ventral and dorsal portions of this primary tube is the neurenteric passage. All that portion of the tube on the dorsal aspect of the notochord anterior to the neurenteric passage becomes converted into spinal cord and brain.

Not only are the dorsal and ventral segments of the tube in connection by the neurenteric passage, but they are intimately associated in a way that is of some importance in support of my contention.

Occupying the flexure of the tubes is a chain of sympathetic ganglia which distribute branches to the ventral and dorsal sections of the tube. Those on the ventral portion of the tube ramify in the walls of the bowel, and are provided with intrinsic ganglia. These nerve plexuses are later recognised by the names of Auerbach and Meissner. Those distributed to the dorsal tube ramify in its substance, and join with groups of nerve-cells contained in the thickness of its walls, which constitute the essential elements of the grey matter of the cord.

These nerves, which bring the dorsal and ventral sections of the tube into such intimate association, are the leukenteric nerves, or splanchnic roots of Gaskell.

The opposite differentiation of the cells composing the walls of the dorsal and ventral section of the tube is very instructive. In

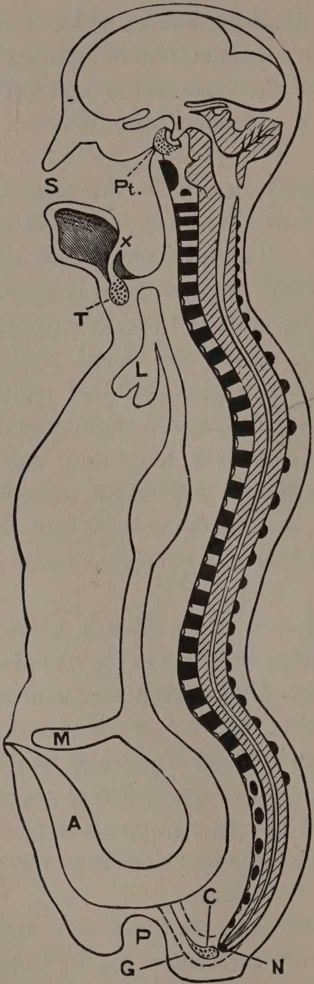

Fig. 45.

A Diagram illustrating the Transformation of the **U**-shaped Tube in fig. 43 and the principal Obsolete Canals.
I, Infundibulum. Pt., Pharyngeal Canal. T X, the Thyreo-lingual Canal. M, Vitello-intestinal Duct. G, Post-anal Gut. C, Coccygeal Body.

the dorsal section the elements have become nerve-cells, whilst those in the ventral limb have metamorphosed into muscle-cells,

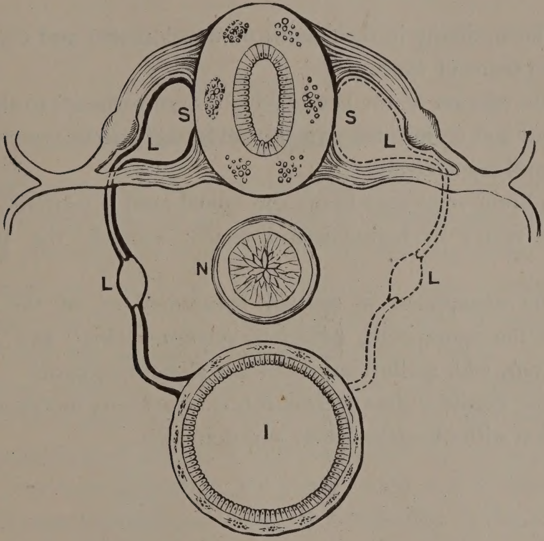

Fig. 46.

Diagram to represent the conditions of the Dorsal and Ventral Segments of the U-shaped Tube and their relation to each other after the transformation.

S, Spinal Cord. N, Notochord. I, Intestine.
L, Leukenteric Nerves.

the two being in close union by means of a leukenteric nerve. Again, the epithelium lining the free surface of the tube in the dorsal limb remains undeveloped ; that in the ventral limb becomes highly differentiated for digestive purposes.

Some of the chief reasons in support of the intestinal origin of the canal of the central nervous system may be summarised thus :—

1. The original continuity of the lumen of the gut and spinal cord.

2. The similarity in their mode of development and correspondence in point of time.

3. The relation of the lateral ganglia (sympathetic) to the walls of the gut and its intrinsic ganglia and to the ganglia (grey matter) of the cord respectively.

4. In lower vertebrate forms the spinal cord is relatively larger than in man; in batrachians it much exceeds the brain in weight.

5. The association of certain malformations of the central canal of the spinal cord, especially *syringo-myelocele* and *syringo-meningocele*, with malformations of the alimentary canal.

We may consider the effects of this extraordinary metamorphosis in relation with obsolete canals and dermoids.

CHAPTER V.

TUBULO-DERMOIDS.

An obsolete canal is one which was functional in the ancestors of modern vertebrata, but now appears in the embryos of existing forms, in obedience to heredity. In the ordinary course of dedevelopment many of these canals disappear; some persist in a rudimentary condition. All those to be considered in connection with dermoids are associated with the alimentary canal.

The more important obsolete canals which exist in higher vertebrates are the central canal of the nervous system, extending from the infundibulum of the third ventricle to the end of the spinal cord, the neurenteric passage, the post-anal gut, the thyreo-lingual duct, the cranio-pharyngeal canal, the branchial clefts, and the vitello-intestinal duct.

Congenital tumours connected with obsolete canals are of three kinds :—

1. Dermoid cysts.
2. Dermoid tumours.
3. Thyroid-dermoids, or congenital adenomata.

The third group (thyroid-dermoids) are peculiar to obsolete canals; structurally they resemble the thyroid body in that they are composed of closed vesicles lined with glandular epithelium and filled with colloid or mucoid fluid. These tumours have been variously described as carcinoma, congenital cystic sarcoma, adenomata, etc. Their leading features may be enumerated thus:

They arise in obsolete sections of the gut, resemble the thyroid body in structure, frequently contain striped and unstriped muscle-fibre and hyaline cartilage, and are congenital, though they may

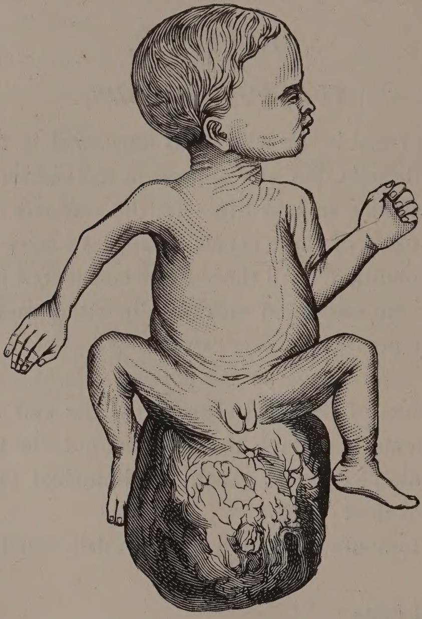

Fig. 47.
Thyroid Dermoid in Coccygeal Region. (After Hutchinson.)

not always be recognised during infancy. As the type of this form of tumour we may select those familiar to surgeons as congenital sacro-coccygeal tumours. They are always congenital, lie anterior to the coccyx and below the levator ani muscle, and correspond to Braune's congenital cystic sarcomata; he regarded them as arising in the coccygeal body. These tumours present very definite characters, and are sure to attract attention on account of their large size (fig. 47). Braune* has collected several cases, and individual specimens have been described by Hutchinson,† Wagstaffe,‡ Shattock,§ and others,|| and often referred to as congenital cystic sarcoma. The naked-eye characters of such tumours are well shown in fig. 48.

In some cases these tumours present a large central cavity filled with mucus; such a cavity is probably due to secondary changes. Microscopically these tumours are composed of cysts and duct-like passages, lined with cubical epithelium, and held together by richly cellular connective tissue. In many situations the epithelium is columnar, set upon flatter cubical cells. The cysts contained ropy mucus. The cysts varied in size from a nutshell to the smallest space visible to the naked eye; many of the cysts contained intra-cystic growths. Hyaline cartilage was also present in the tumour.

Athough in the majority of cases these tumours project downwards between the legs, such is not always the case. The tumour sometimes extends upwards and overlies the lower extremity of the spine, and resembles a spina bifida tumour.

This form of congenital sacro-coccygeal tumour arises in connection with the post-anal gut and neurenteric passage.

The first to associate a congenital sacro-coccygeal tumour with the post-anal gut was Dr. K. Middledorpf.¶ His specimen was

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* "Doppelmissbildung, etc."

† "Illustrations of Clin. Surgery," Fas. xiii.

‡ St. Thos. Hosp. Rep., vol. iv.

§ Trans. Path. Soc., vol. xxxii., p. 197.

|| *Virch. Archiv.*

¶ "Zur Kenntniss der Angebornen Sacralgeschwülste," *Virchow's Archiv*, Bd. ci., S. 37.

removed from the neighbourhood of the anus of a girl a year old. The tumour was composed of fatty and richly cellular connective tissue, and contained mucous membrane with characteristic Lieberkuhn follicles, solitary follicles, sub-mucous tissue, longitudinal and circular layers of striped muscle fibre.

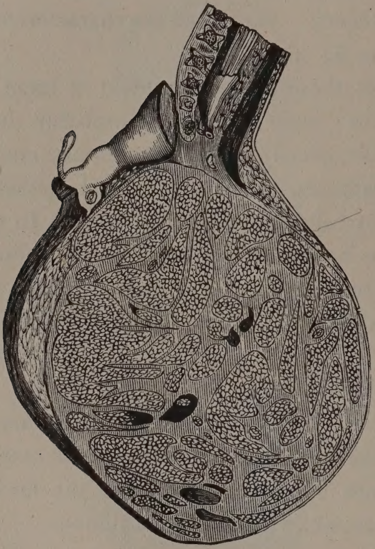

Fig. 48.

A Congenital Sacro-coccygeal Tumour, originating in the Post-anal gut. A glass rod is passed into the rectum. (After Shattock.)

I had come to the same conclusion before the publication of Middledorpf's paper, but his case is the most conclusive one on record.

Dermoid cysts and tumours other than those we have just considered, connected with these passages, are, as a rule, situated between the rectum and sacrum. Occasionally, when large, they make their way between the bladder and rectum in the male, or rectum, vagina, and uterus in the female.

The following specimens will serve to illustrate this type of dermoids. The first is a cyst, of the size of a walnut, containing curly locks of brown hair, bony and well-formed teeth, attached to the sacral aspect of the rectum (fig. 49). Mr. J. H. Targett exhibited a dermoid at the Pathological Society,* which was removed by Mr. Bryant from between the coccyx and rectum of a lad aged nineteen. The tumour was of the size of an orange, and made of cysts and loculi, some of which were filled with

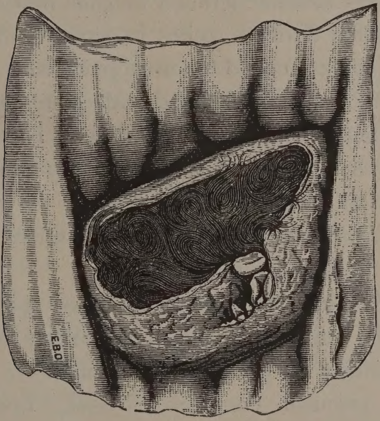

Fig. 49.
A Dermoid Cyst attached to the Sacral Aspect of the Rectum.

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* Path. Soc. Trans., vol. xxxviii., p. 395.

pultaceous material. It also contained an irregular-shaped piece of bone. The cyst walls were lined with columnar epithelium, beneath which were layers of flattened and round cells.

Of dermoids which present themselves as large cysts occupying the space between the rectum and bladder, one of the best accounts is that by Dr. Ord.* The patient was a man aged twenty-eight years, and the dermoid weighed fourteen pounds and a half; it measured thirteen inches in length and ten inches in breadth. The cyst contained the usual pultaceous material, mixed with hairs. The cyst wall was lined with piliferous skin, containing sebaceous, but no sudoriparous glands. The account of this specimen is rendered more valuable by a report furnished by Bernays of the fluid contents of this cyst.

Several cases of dermoid occupying a similar position in the pelvis of women have been recorded.

The Infundibulum.—Several well-described specimens of dermoids arising in connection with the pituitary fossa have been recorded. Bowlby † has described a tumour of the pituitary body, composed of vascular connective tissue, cysts lined with epithelium, and bone; the tumour was of the size of a walnut, and occurred in a man aged twenty-two years.

Hale-White ‡ met with a similar dermoid, of the size of a nut, growing from the pituitary body and involving the optic commissure; it contained connective tissue, vessels, fat cells, white nerve fibres (some in bundles as large as the radial nerve), ganglionic cells, and striped muscle fibre. The patient was a boy aged twelve years.

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* Med-Chir. Trans., vol. lxiii., p. 1.

† Path. Soc. Trans., vol. xxxvi., p. 35.

‡ Path. Soc. Trans., vol. xxxvi., p. 37.

Lawson [*] described a tumour which grew from the body of the sphenoid, and projected into the orbit. It consisted of hyaline cartilage, spindle cells, cysts lined with squamous epithelium, and glandular tissue. The patient was two days old.

Thyroid Dermoids.—Among recorded cases the following may be mentioned. A baboon (*Anubis*) which had lived in the Zoological Gardens presented at the base of its brain a large, ragged-looking tumour over the optic commissure. The nerves and other parts of the brain appeared quite healthy. Dr. Goodhart[†] described the specimen as evidently having its origin in the pituitary fossa. It was composed of large, epithelial-looking cells, arranged in alveolar manner. This arrangement of cells, considered in relation with the epiblastic origin of the pituitary body, Dr. Goodhart thought justified the tumour being regarded as a carcinoma. The brain and tumour are preserved in the museum of the Royal College of Surgeons.

Mr. W. K. Sibley [‡] has described a similar specimen from a ewe. The tumour was as large as a walnut. I examined some of the sections under the microscope, and found them identical in structure with the thyroid body.

The Cranio-pharyngeal Canal.—This passage extends from the floor of the cella turcica to the pharyngeal aspect of the basi-sphenoid. It may be readily detected as a small canal in the macerated sphenoid bone of the fœtus; in the last months of fœtal life it is filled with fibrous tissue. If the posterior wall of the pharynx be carefully examined in the fœtus at the time of birth, a recess will be seen in the mucous membrane exactly in the middle line, close up to the base of the skull. This recess, which is often half an inch deep, is known as the bursa pharyngea (it frequently exists in the adult), and marks the pharyngeal termination of the fibrous tissue lodged in the cranio-pharyngeal canal. The orifice of this recess is surrounded by lymphoid tissue, and is known as the pharyngeal tonsil.

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[*] Path. Soc. Trans., vol. xxxv., p. 379.

[†] Path. Soc. Trans.

[‡] *Ibid*, vol. xxxix., p. 459.

The cranio-pharyngeal canal is the remains of the space originally enclosed by the open arms of the trabeculæ cranii, whilst the mucous membrane which occupies it represents the diverticulum from the stomodæum, known as the pouch of Rathké, which brings the pharynx into relation with the infundibular prolongation of the third ventricle of the brain, the meeting-point of the two funnels being accurately indicated by the pituitary body.

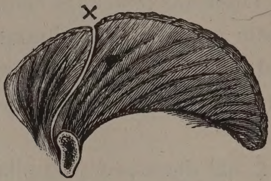

Fig. 50.

A Longitudinal Section through a Human Tongue, showing the Lingual Duct.

The precise significance of this relation of the pharynx and infundibulum is difficult to estimate clearly, but it is probably closely related to the original function of the infundibulum. From what has already been stated regarding obsolete canals, it would be expected that the roof of the pharynx should be occasionally the seat of dermoids.

Some cases of dermoid tumours hanging from the roof of the pharynx have already been mentioned, and adenomata in young children are not uncommon in this situation, but more precise observations are requisite before the true relation of the bursa pharyngea to these tumours can be satisfactorily established.

The Thyroid Body and its Duct.—In all vertebrata the thyroid body arises as one or more diverticula from the ventral wall of the pharynx, or floor of the mouth ; in a few of the lowest forms it retains its connection with the pharynx, but in higher forms this communication becomes shut off and the duct rendered obsolete. In man and other higher mammals this communication is represented in the embryo, and the passage (first detected by His) is known as the thyreo-hyoid duct (fig. 45). On the appearance of the hyoid bone the duct becomes divided ; the segment in relation with the tongue is the lingual duct, whilst the portion till retaining its connection with the thyroid is the thyroid duct, but more commonly known as the processus pyramidalis, and as it is often surrounded by muscular tissue, is frequently described in anatomical text-books as the levator glandulæ thyroidea. Each duct will now be separately considered in its relation to dermoids.

This duct, according to my dissection, seems to be present about once in every ten subjects examined, and is sufficiently large to admit a bristle ; in some cases it is merely represented as a band of fibrous tissue. The canal, when well developed, is lined with epithelium. Its position in the tongue is somewhat diagrammatically shown in fig. 50.

It is easy to understand that if this duct is persistent, but both extremities become obliterated, the continual shedding of the epithelium, and the accumulation of sebum from the glands which occasionally exist in its walls, will in due time dilate it into a cyst of fair dimensions.

Lingual Dermoids.—This will form a useful group with which to begin. Lingual dermoids, like dermoids occurring on the scalp, have frequently been mistaken for sebaceous cysts, and thus dermoid cysts arising in the tongue have been regarded by most writers as rarities. Such, however, is not the case. Mr. Barker,* in his excellent paper on lingual dermoids, gives references to sixteen cases, and classifies them as follows :—

1. They may be unilateral, lying between the geni-hyo-glossi and the mylo-hyoid muscles, on one side or the other.

2. They may be central, lying between the genio-hyo-glossi muscles.

3. They may be bilateral, lying between the mylo-hyoid and genio-hyo-glossi muscles on each side.

It is the second group, dermoids occupying the space between the genio-hyo-glossi muscles, that we are concerned with just now. These central dermoids arise as retention cysts in the lingual canal.

I once had an excellent opportunity of studying the anatomy of a lingual dermoid. A man aged twenty-four years was under my care for a so-called ranula. He had, during nine years, been submitted to seven operations, but without success. When I saw the patient I passed a thin knife into the cyst, some sebaceous material escaped, and the smell settled its dermoid character. On dissecting out the cyst I found it situated between the genio-hyo-glossi muscle, and extended from the mucous membrane near the foramen cæcum to the basi-hyoid. It was as large as a bantam's egg, and contained hairs, sebum, and cholesterin. The walls presented a few fine hairs, and were beset with sebaceous glands.

Mr. Stephen Paget† reported a specimen of this nature which was remarkable that in addition to hair, epithelium, and glands, a deposit of granular black pigment was found in the deeper layers. The cyst was removed by Mr. Butlin from under the tongue of a little girl. It lay in the middle line of the floor of the mouth.

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* Clin. Soc. Trans, vol. xvi., p. 215.

† Path. Trans., vol. xxxvii., p. 225.

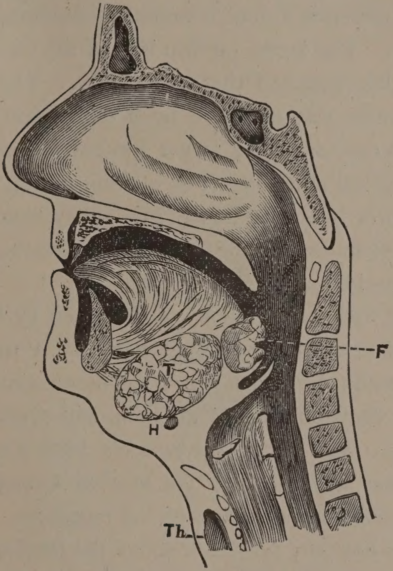

Fig. 51.
A Tumour in the Tongue, in the position of the Lingual Duct, structurally resembling the Thyroid Body. (After Bernays.)

Lingual dermoids are rarely sufficiently large to allow of their detection in infants. Richet, however, removed one from a child a few days old, in l'Hôpital St. Louis. In addition to the references by Barker in the paper already referred to, Jean Cusset* furnishes a goodly list, and many of his cases are recorded in detail for the first time.

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* "Branchial Fistulæ," Paris, 1877.

The lingual duct, like the infundibulum and post-anal gut, may give rise to tumours resembling in structure the thyroid body, as in the following case, reported by A. C. Bernays.* The patient, a female, aged seventeen, had a tumour, consisting of two parts, on her tongue. The larger portion was of the size of a bantam's egg; the smaller equalled that of a cherry. The upper part of the smaller tumour was occupied by a depression corresponding to the foramen cæcum. The larger tumour was situated between the genio-hyo-glossi muscles. The relation of the tumours to the surrounding parts is shown in fig. 51. They were easily shelled out, and when examined by the microscope were found to resemble the normal thyroid body.

A somewhat similar specimen was described by Dr. Hickman,† which occurred at the base of the tongue in a new-born female child. The tumour projected above the mucous membrane of the tongue, about three-quarters of an inch, and prevented the child from breathing. The infant survived its birth a few hours only. The tumour was submitted to the Morbid Growths Committee. The following was the substance of the report:—

The tumour not only projected above the tongue, but extended deeply into its substance. The bulk of it appeared to be made up apparently of glandular follicles, ducts, and vessels, embedded in a matrix of nucleated connective tissue. Some of the follicles contained material resembling coagulated mucus.

Rushton Parker ‡ reported a specimen which was probably of this nature. The patient was a girl aged sixteen years and a half;

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* *St. Louis Med. and Surg. Journal*, vol. lv., p. 201.

† Trans. Path. Soc., vol. xx., p. 160.

‡ Trans. Path. Soc., vol. xxxii., p. 238.

the tumour was situated under the mucous membrane at the base of the tongue, and was as large as a walnut. Structurally it consisted of glandular tubes lined with cubical epithelium of uniform size; some of them contained a plug of gelatinous material. It was described as a tubular adenoma.

The Thyroid Duct.—In mammals it is normal that this duct should disappear, but in adults it may persist in three forms—1. As a duct running from the isthmus of the thyroid body to the posterior aspect of the hyoid bone, surrounded by muscular tissue (fig. 52). This duct is often easily capable of admitting a probe. 2. It may be partially obliterated, the interrupted portions becoming dilated, so as to produce a moniliform condition. 3. The space usually occupied by the duct is represented by a series of detached bodies known as accessory thyroids.

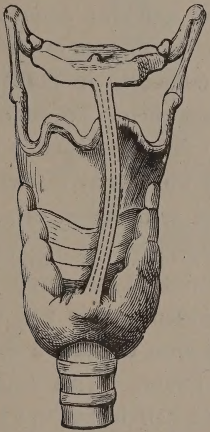

Fig. 52.
A Persistent Thyroid Duct.

The thyroid duct and the accessory thyroids derived from it occasionally become the germs of cysts, sometimes of important size. Accessory thyroids have been known to acquire large proportions in cases where the main thyroid has been extirpated by the surgeon. Cysts are by no means infrequent in the neighbourhood of the hyoid bone. Some of them are of slow growth and contain much solid material; others are filled with fluid and grow quickly; many of them are unilateral, and often mistaken for enlargements of one lobe of the thyroid. As a rule, a correct diagnosis is not made unless the surgeon attempts to extirpate them; he then finds them unconnected with the thyroid. Cysts developed in accessory thyroids in some instances are filled with warty masses, and occasionally are the sources of malignant tumours of the neck. In rarer cases the cyst walls may calcify.

The most interesting of all forms of thyroid cysts in connection with our present study are dermoids. Shattock* has described a typical form of such a cyst, which he dissected in the neck of an infant. This tumour was ovoid in form, measuring four and a half inches in its vertical, and three and a half inches in its short axis, and occupied the position of the thyroid body. On section it displayed a loculated structure; the cystic spaces contained soft material. The microscope showed it to contain hyaline cartilage and acinous adenoid tissue, lying in young connective tissue. The glandular epithelium was cubical.

Shattock sums up his clear account of the specimen thus: "The specimen is doubtlessly related to the congenital sacral tumours, and has characters indicative of an early intra-uterine formation in some aberrant embryonic structure." Shattock also informed me that he could not find a thyroid body distinct from the tumour. This is a fact of some importance, for I am of opinion that the tumour originated in the thyroid diverticulum, and is to be regarded as an aberration analogous to those

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* Trans. Path. Soc., vol. xxxiii., p. 289.

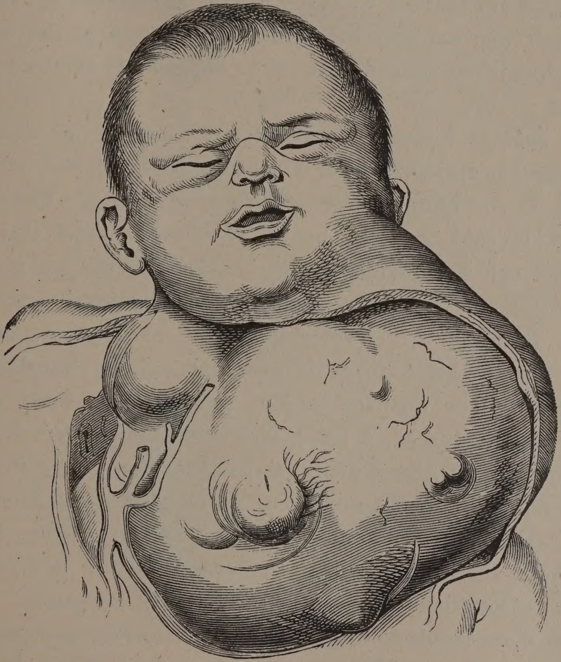

Fig. 53.

Congenital Tumour replacing the Thyroid Body. Thyroid Dermoid. (Museum, St. Thomas's Hospital.)

occurring in the post-anal gut. In support of this opinion I will adduce as evidence the following facts: The museum of St.

Thomas's Hospital contains the upper part of the trunk of a mature fœtus. The neck is occupied by an enormous tumour replacing anatomically and resembling in shape the thyroid body (fig. 53). Through the generous co-operation of Mr. Shattock I am enabled to represent the appearance of the parts in section (fig. 54), and the naked-eye features of the tumour are strikingly in accord with the congenital sacro-coccygeal tumours.

The analogy, however, does not rest here, for on examining the tumour microscopically it is seen to be composed of loculi, varying in size from a millet-seed to a small nut. The cavities contain mucoid material, but it is only here and there that evidence can be obtained of parietal epithelium. The matrix of the tumour consists of richly cellular connective tissue, in which tracts of well-developed hyaline cartilage occur. In many places this cartilage is undergoing direct transformation into bone. The cartilage in this specimen is typical of that found at the end of a fœtal long bone, and differs from that so common in chondrifying sarcomata. In the latter case the cells are stellate, and do not present the sharp contour so characteristic of well-formed hyaline cartilage. Thus, in their naked-eye character, in their minute structure and embryological associations this particular form of congenital thyroid tumour corresponds so closely with the sacro-coccygeal glandular tumour that they ought to be classed together. For accounts of some of these tumours the following works may be consulted: Von Ammon, *Die Angeborenen Chirurg. Krankeiten*, Tab. xiii., xxxiii. Holmes, *Lancet*, May, 1864. T. Smith, St. Barth. Hosp. Rep., vol. ii., p. 16.

The Vitello-intestinal Duct.—It is not uncommon to find connected with the umbilicus of infants and young children small tumours varying in size from a pea to a cherry. As a rule they are of a bright red colour, soft and velvety to the touch, often attached to the navel by thin slender pedicles, but occasionally they are sessile. When pedunculate they resemble red currants.

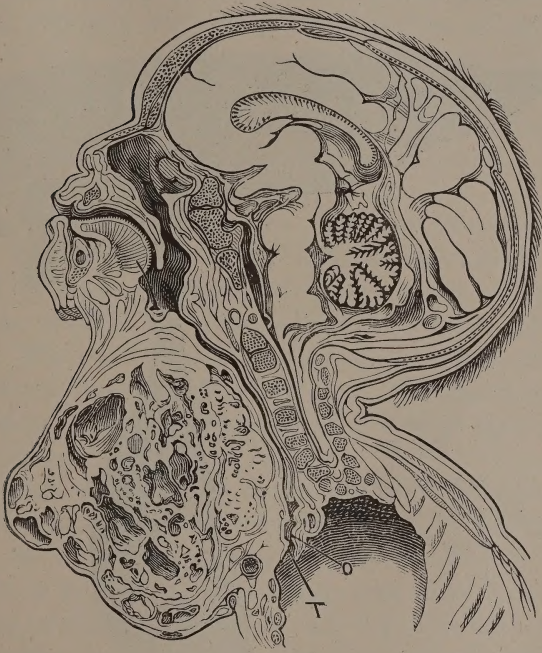

Fig. 54.
The Tumour in Section.

When examined histologically these tumours present unstriped muscle-fibre, mucous membrane, Lieberkuhn's follicles, and columnar epithelium, collected into a mass; in rarer instances the tumour presents as a cyst projecting externally and internally; such cysts present internally mucous membrane typical of the small intestine, with villi, columnar epithelium, and follicles. Such cases are easily confounded with the sac of an umbilical hernia. A very instructive case is reported by Roser. A young man came under his care suffering from a sinus at the umbilicus, from which a slimy discharge issued. Some time before, a surgeon had removed a small cyst which projected from the navel, but the wound never healed. The discharge from the sinus frequently corroded the surrounding skin. On introducing a

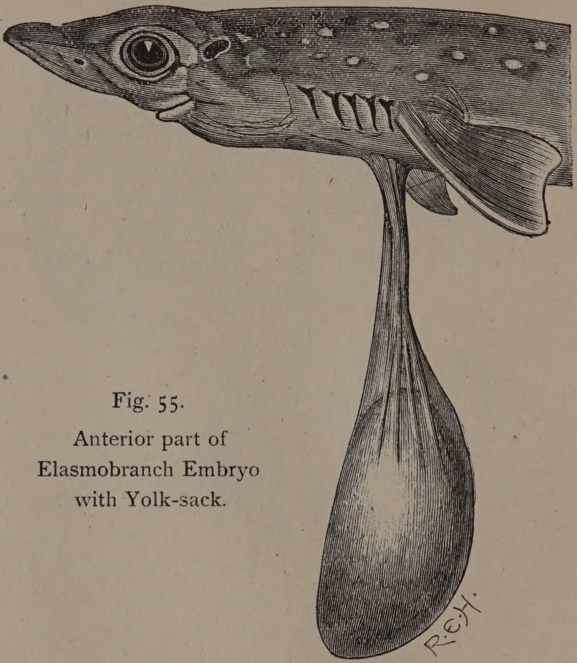

Fig. 55.
Anterior part of
Elasmobranch Embryo
with Yolk-sack.

probe, the sinus was found to lead into a cavity measuring six centimetres in diameter. The cyst was removed, and microscopical examination showed it to present all the histological characters of intestine.

Such cysts and pedunculated tumours admit of easy explanation, for they take origin in persistent portions of the Vitello-intestinal duct. This duct when persistent presents the normal structure of bowel, and like the vermiform appendix, possesses an abundance of adenoid tissue. For details of individual cases the following references be may consulted: Kolaczek,* Roser,† Gould,‡ Colman.§

In some of these cysts the epithelium, instead of preserving its columnar character, becomes squamous. Lannelongue‖ described a pedunculated tumour of the size of a nut which he removed from the umbilicus of a child eight years of age. The pedicle was short and narrow. When examined after removal it was found to be a cyst. The interior was lined with flattened epithelium, supported by a vascular layer of connective tissue.

The vitello-intestinal duct cannot strictly be regarded as an obsolete canal, because in some forms it fulfils the function of a duct. In most vertebrates the yolk is absorbed by vessels ramifying on its surface. For elasmobranchs Balfour¶ makes the following statement: "Nutriment from the yolk-sack is brought to the embryo partly through the umbilical canal and so into the intestine, and partly by means of blood-vessels in the mesoblast of the sack."

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* *Langenbeck Arch.*, Bd. xviii., S. 349, 1875.

† *Ibidem*, Bd. xx., S. 472, 1877.

‡ Trans. Path. Soc., vol. xxxii., p. 204.

§ *Ibidem*, vol. xxxix., p. 110, 1888.

‖ "Kystes Congenitaux," 1886.

¶ "Comp. Embry.," vol. ii., p. 53.

CHAPTER VI.

BRANCHIAL CYSTS.

Since 1825, when Rathké, one of the most accurate observers who has ever lived, found evidence in the embryo of a pig,

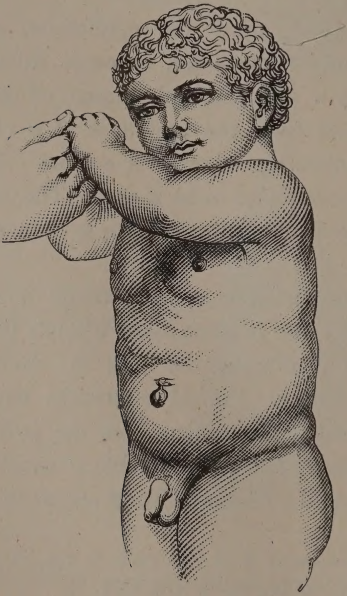

Fig. 56.

A Child with a Pedunculated Tumour hanging from the Navel. The tumour originated in a persistent portion of the Vitello-intestinal canal.

horse, and chick of the branchial clefts so characteristic of fish, many eminent anatomists have confirmed his observations and extended the view to vertebrata generally. Rathké was also fortunate enough to detect the fissures in the neck of an early human embryo, and, in a letter to Von Baer, he states that they were of such distinctness that there could be no doubt about them.

Although congenital fistulæ in the neck were not described by Dzondi until 1829, under the name of tracheal fistulæ, four years after Rathké's discovery, he failed to connect the two conditions.

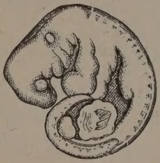

Fig. 57.
A Human Embryo, with its Branchial Clefts.

Three years later Ascherson showed that the fistulæ were connected with the pharynx and not with the trachea. After the publication of Ascherson's observations numerous instances of cervical fistulæ were recorded, which enabled Heusinger,* in 1864, to analyse forty-six examples of the malformation, in a paper entitled "Hals-kiemen-fisteln von noch nicht beobachteter Form." The heading of the paper clearly shows that Heusinger was well aware of the relation of these fistulæ with the branchial spaces.

Since that date our knowledge of these fistulæ has been considerably increased by the careful reports published from time to time of individual cases. It will be necessary to arrange branchial fistulæ into two groups: 1, those situated in the neck; 2, those occurring in the pinna.

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* *Virchow's Archiv*, Bd. xxix.

The following may be enumerated as the chief features of cervical branchial fistulæ: They are always congenital, and appear as fine canals, capable of admitting a bristle, and in some

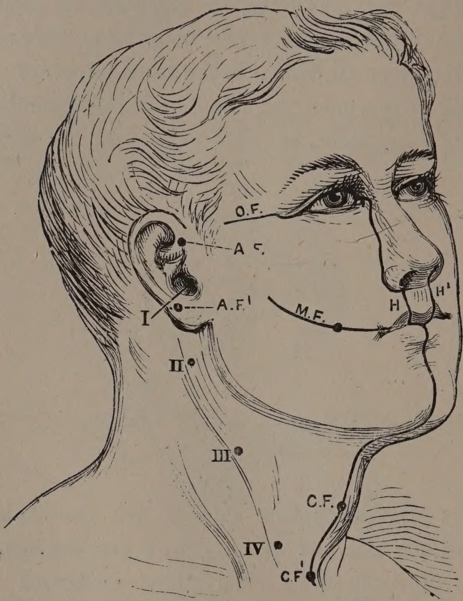

Fig. 58.

A F, A F′, Situations of Congenital Auricular Fistulæ. I, II, III, IV indicate the External Orifices of *Branchial* Fistulæ. I is the External Auditory Meatus, O F the Orbital Fissure, M F the Mandibular Fissure, H H′ the Lines of Lateral Hare-lip; C F, C F′, mark the Situations of Congenital *Median Cervical* Fistulæ.

cases a fine probe. The orifice usually opens in the neck, but when complete into the pharynx also. There is reason to believe that they may open into the pharynx, but end externally as a *cul-de-sac*. One, two, or three fistulæ may be present in the same individual; they have a great tendency to be bilateral, to affect several members of the same family, and to be transmitted to several generations. The canals, which may vary in length from half an inch to two inches or more, are lined by mucous membrane, sometimes with ciliated epithelium, or by skin containing sebaceous glands. The lining membrane of the canal usually secretes a thin mucous fluid, which may become increased during catarrhal conditions of the respiratory passages. Occasionally the canal inflames, and an abscess results, which may give rise to considerable pain and difficulty in deglutition. The external orifice of a branchial fistula may be indicated by a tag of skin, which often contains a piece of yellow fibro-cartilage. These cutaneous processes, or cervical auricles as they are called, may attain a large size. Not infrequently a cervical auricle is present, and of large size, without any evidence of a fistula.

1. *Cervical Branchial Fistulæ.*—Neglecting for the present the first cleft—the tympano-Eustachian passage—it may be convenient to consider the situations usually occupied by these fistulæ when they occur in man.

The external orifices are apt to vary, but they usually open in the situations shown in fig. 58. The clefts usually represented number four. The first becomes the tympano-Eustachian passage; the second opens close behind the angle of the jaw anterior to the line of the sterno-mastoid muscle; in a few cases it may be seen on a level with, and slightly posterior to, the lobule of the pinna.

The third is situated on a level with the thyro-hyoid space close to the level of the anterior border of the sterno-mastoid: this situation is very constant.

The fourth opens, as a rule, immediately above the sterno-clavicular articulation, but it may open an inch or an inch and a half higher in the neck, but like the others, it always lies close to

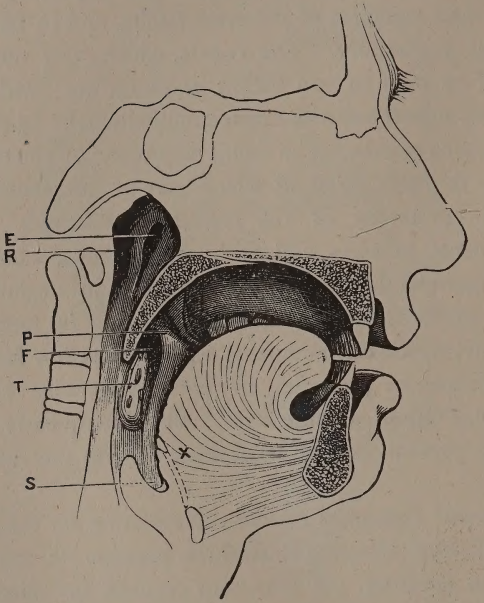

Fig. 59.

A Longitudinal Section of the Human Pharynx. E, Orifice of the Eustachian Tube. R, Rosenmüller's Fossa. P, Plica Triangularis. F, Fossa Supra-tonsillaris. T, Tonsil. S indicates the Sinus Pyriformis, X the Lingual Canal. (Modified from His.)

the anterior border of the sterno-mastoid. They persist in the following order of frequency: the fourth in the majority of cases, then the third, but the second very rarely. The internal orifices of the branchial fissures are indicated in the following manner: On bisecting the pharynx, as shown in fig. 59, we readily recognise the following landmarks: E, the pharyngeal orifice of the Eustachian tube; R, the fossa of Rosenmüller; P, plica triangularis; F, fossa supra-tonsillaris; T, tonsil; S, the sinus pyriformis. Each must be separately considered. It is beyond all dispute that the pharyngeal orifice of the Eustachian tube indicates the inner end of the first cleft. The orifice of the second corresponds to the fossa of Rosenmüller and the recess containing the tonsil; the two depressions are separated from each other by a fold of mucous membrane known as the plica triangularis. Rosenmüller's fossa is difficult to display in longitudinal section of the pharynx, but comes out well in transverse section of the head if made close to and parallel with the Eustachian tube (fig. 60).

The fossæ are relatively larger in the child than in the adult, and contain a large amount of adenoid tissue.

The third and fourth clefts in the embryo do not, according to His, open directly into the pharynx, but into a blind recess, named by him the *sinus precervicalis*, which has intimate relation with the development of the thymus gland. In the adult, branchial fistulæ, due to persistence of the third and fourth cleft, open into the sinus pyriformis, the *cul-de-sac* situated in the mucous membrane on each side of the epiglottis. To reach this sinus a fistula corresponding to the third cleft must pass over the *plica nervi laryngei*, or curve formed by the superior laryngeal nerve. His states that when these fistulæ communicate with the pharynx it is artificial, and due to the passage of a probe. I have satisfied myself, however, in many cases, that the communication exists independently of the probe.

Abnormal persistence of branchial clefts occurs in four forms :—

1. Complete fistula.

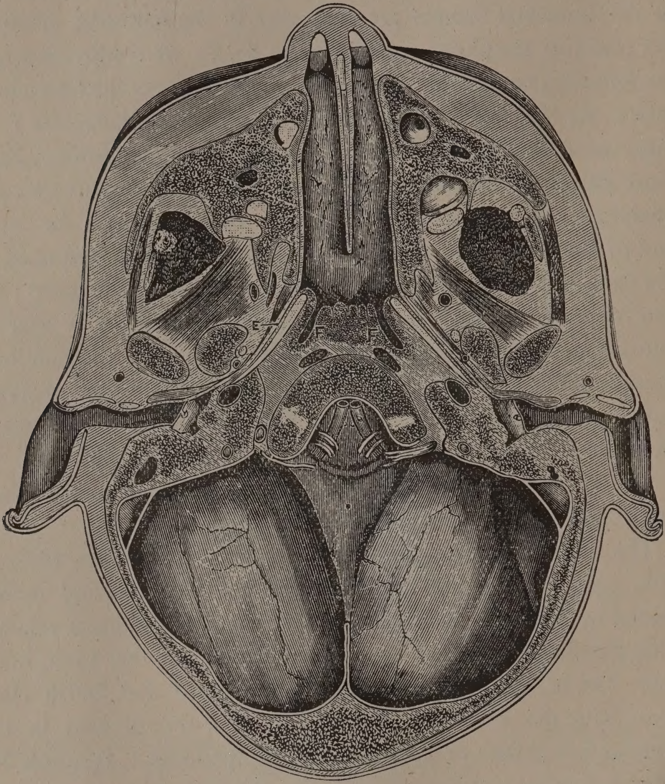

Fig. 60.

Horizontal Section of the Pharynx of a Child, showing Rosenmüller's Fossa, F F. The Eustachian Tube, E. (After Symington.)

2. There is an external orifice, but the passage ends internally in a *cul-de-sac.*

3. The internal orifice alone persists.

4. The external and internal orifices are occluded, but an intermediate segment persists.

The first form, complete fistulæ, as far as my own observations extend, occur most frequently in connection with the second cleft. In one case, a youth, aged fifteen years, the communication with the pharynx was so complete that when he swallowed milk some of the fluid occasionally passed through the fistula, and appeared at the cutaneous orifice. In another case, that of a little girl, aged ten, saliva issued at the cervical orifice when the child had been talking freely, and had thus excited the parotid gland to unusual secretory exertion.

The second set of cases, those with external openings, but ending blindly in the neck, are the most common examples, and need no further comment.

The third class are rarely recognised; this is not remarkable when we remember that they open into the pharynx, but end externally as *cul-de-sacs.* Heusinger was of opinion that some pharyngeal diverticula are of this nature, and Sir James Paget refers to the probability that some rare instances of diverticula from the pharynx may be regarded as dilatations of portions of branchial fistulæ, closed externally, but remaining open within.

The most remarkable case, undoubtedly, of this nature that has been placed on record is the specimen which occurred in the body of an adult male dissected in the University of Edinburgh, and described by Morrison Watson.*

A tube, terminating inferiorly in a *cul-de-sac* containing a large quantity of grumous material, was found extending from the pharynx, immediately behind the tonsils, to the interclavicular notch. The tube possessed muscular walls, and in the deep part of its course passed between the fork of the carotids, over the *plica nervi laryngei*, and in the lower part was parallel with the anterior border of the sterno-mastoid muscle; internally it rested on the sterno-hyoid and sterno-thyroid muscles. It communicated with the pharynx by means of a slit-like opening, not more than an eighth of an inch in length, the margins of which were so closely in contact that the entry of solid particles into it from the mouth must have been prevented. The diverticulum itself increased in calibre from above downwards, so that whilst at the upper end a crow-quill could with difficulty be introduced, at its lower a pencil could readily be passed along the lumen of the tube.

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* *Journal of Anatomy and Physiology*, vol. ix., p. 134.

It is further noteworthy that the pharyngeal orifice was situated between the lower jaw and the stylo-hyoid ligament. Its point of departure from the pharynx corresponds to the fossa supra-tonsillaris. The muscle fibres were, for the most part, red and striated, and the mucous lining resembled that of the œsophagus.

Aubrey* has recorded an example of this form of diverticulum, which occurred in a fowl ten months old. The bird presented a tumour immediately above the sternum, of the volume of an egg. It was thought to be an abscess, and a bistoury was plunged into it, but instead of pus, food made its appearance. On giving the bird water, it escaped from the opening. By introducing the finger the gizzard could be felt. A pad of pitch was placed over the orifice, and in time the wound contracted, leaving a small but permanent fistula.

Diverticula from the pharynx and œsophagus are common enough as herniæ of the mucous coat, through weak points in the muscular wall; but some of the rarer forms, which will not admit of this explanation, may safely be ascribed to persistent branchia spaces. Doubtless they are of more frequent occurrence than the number of recorded cases would lead us to believe; it is almost a

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* *Recueil de Medecine Ve'erina're*, 1863, quoted in Heusinger's Memoir.

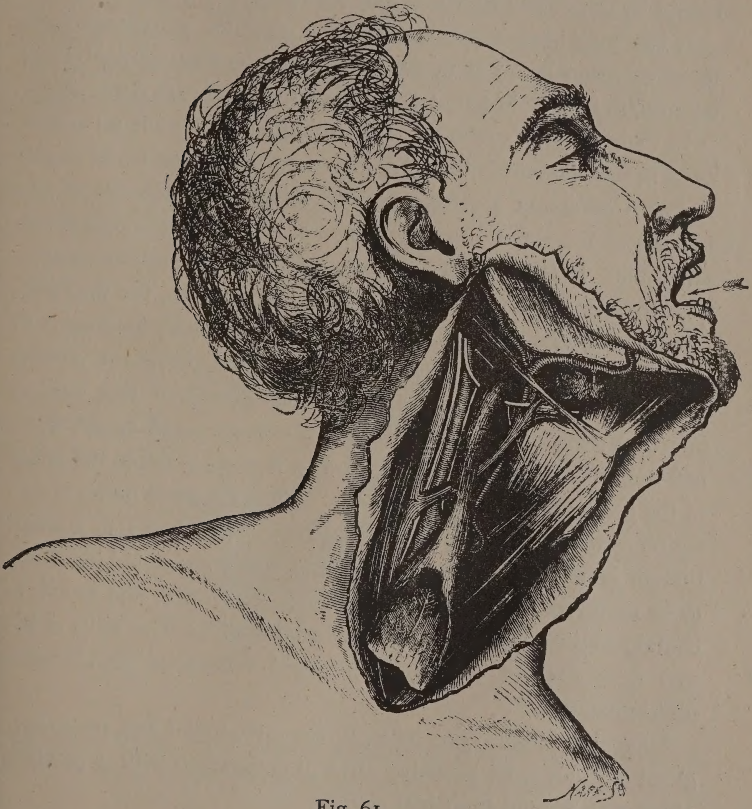

Fig. 61.
A Diverticulum from the Pharynx (after Morrison Watson).

matter of accident when such cases fall into the hands of observers competent to deal with them.

The fourth class, or those closed at each end, leaving a portion of unobliterated canal remaining in the neck, cannot be recognised except by the effects to which they give rise.

It has long been suspected that the so-called sebaceous cysts which occasionally occur in the neck below the deep cervical fascia take origin in unobliterated branchial spaces, and are dermoids.

In their mode of origin and the structure of the walls sebaceous cysts in this situation differ very materially from those found on the scalp. Commonly a sebaceous cyst arises by distension of the follicles of the gland, in consequence of obstruction to the excretory duct. In the cysts we are now considering the sebum escapes from the glands, but collects in a closed cavity, viz., the unobliterated segment of the cleft. Hence, they are exactly analogous to the dermoids of the tongue, originating in the persistent portion of the lingual canal. The most convincing case of this kind is one by Virchow.* In this instance a woman, aged twenty-four, had noticed, since the age of fourteen, a tumour between the angle of the jaw and the mastoid process. When she came under observation it was of the size of a goose's egg. She had also a small tumour immediately above the sternum, which she would not allow to be removed. The larger tumour was extirpated, and found to contain sebaceous matter and epidermal scales. The walls of the cyst were covered with epidermis, and sebaceous glands were disseminated in it.

Lingual dermoids lying between the mylo-hyoid and genio-hyo-glossi muscles most probably arise in connection with a partially obliterated second branchial cleft.

A retention cyst, arising in connection with partially obliterated branchial cleft, need not necessarily contain sebaceous matter; cysts filled with mucus, and occasionally of large size, are to be observed in the neck. This apparent contradiction is capable of

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* *Archiv*, Bd. xxxv., 1866.

easy explanation. The internal segment of a branchial fistula is lined by mucous membrane continuous with that of the pharynx, whilst its external segment is a continuation of the surface epithelium of the neck. It is to this transitional arrangement that some branchial fistulæ are described as presenting ciliated epithelium, others squamous, and so forth. If a cystic dilatation arise in connection with the inner segment, a cavity with mucous contents would be the result, whilst in a similar cyst arising from the external segment epidermal scales, sebaceous matter, and cholesterine would be expected. As far as my own observations go,

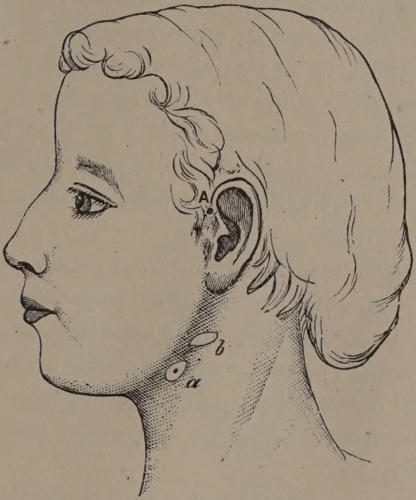

Fig. 62.
Head and Neck of a Young Woman, showing Branchial Fistulæ in the Neck, *a*; and one in the Helix, A. (After Heusinger.)

mucous cysts originating in this manner attain larger dimensions than the dermoid varieties.

In the copy of Heusinger's sketch (fig. 62) we find a clear space indicated by the letter *b*, which is thus described in the original: "Immediately above the opening is a slight elevation of normal coloured skin." In Knox's translation of Dzondi's paper the translator remarks that in many persons, in the region where fistulæ have been observed, he had noticed one or more discoloured spots, which spots are either rounded and of a pale red colour, or brownish, or like subtile striæ of hairs, superior in whiteness to the surrounding skin, but conspicuous only to very sharp sights. I have occasionally found these spots referred to by Knox in persons with branchial fistulæ; they are not infrequent near the angle of the jaw, and correspond to the external orifice of the second cleft.

Our knowledge of branchial fistulæ in mammals other than man is very limited. Heusinger mentions the occurrence of congenital cervical fistulæ in horses immediately below the ear and near the angle of the jaw. They are more frequently found in carriage than in draught horses; the secretion or discharge which issues from them when inflamed soils the surrounding skin and attracts the groom's attention.

There are many reasons for believing that the two remarkable pouches which occupy the naso-pharynx in the horse, into which the Eustachian tubes open, represent the dilated inner ends of the second branchial clefts. The cavities known as the guttural pouches replace the fossæ of Rosenmüller and the tonsils in other mammals.*

Congenital fistulæ in the middle line of the neck must not be confounded with branchial fistulæ.

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* *Veterinarian*, 1888.

2. *Congenital Auricular Fistulæ.*—Heusinger seems to have been the first to describe congenital fistulæ connected with the auricle, and in the case already alluded to as "Von noch nicht beobachteter Form" the peculiarity consisted in the existence of a fistula in the helix (fig. 62).

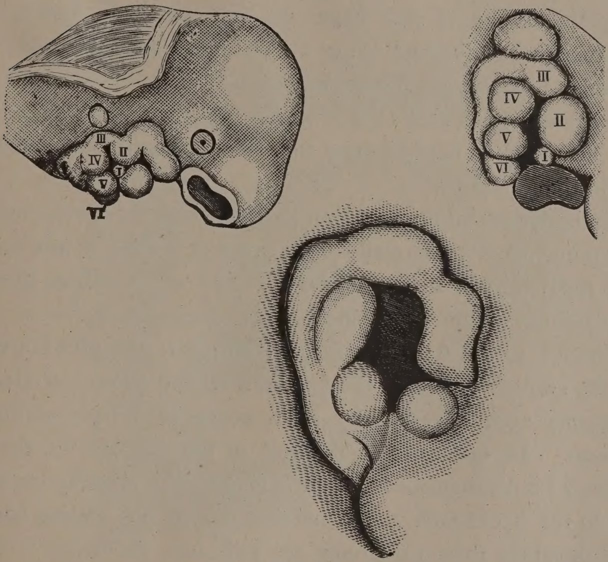

Fig. 63.
Three Drawings representing the Development of the Human Pinna.
(Modified from His.)

The most complete account of these auricular fistulæ which has yet appeared in our language is by Sir James Paget.* The fistula usually appears as a small opening leading into a canal ending blindly in the substance of the helix. Paget says of them, "It might have been very hard to explain these fistulæ in the ears, if their meaning had not been indicated by the co-existence of well-marked branchial fistulæ in the necks of the same person or members of the same family." The same author further writes, "So may these aural fistulæ be regarded as due to incomplete closure of the upper or first post-oral fissure, or rather that part of it which is not utilised in the formation of the Eustachian tube, tympanum, and meatus." I shall take occasion to show that the last part of this sentence is the correct one. It is also necessary to bear in mind that similar canals occasionally occur in the lobule.

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* Medico-Chir. Trans., vol. lxi., 1878, p. 41.

Some important additions to our knowledge of the development of the pinna have been made by His,* which shed a new light on the relation of branchial fistulæ in the pinna, as well as afford an explanation of the occurrence of supernumerary auricles.

Reference to fig. 63 will serve to show that the pinna arises from the swollen edges of the first and second branchial clefts. The germs appear very early as a series of sharply defined elevations. In embryos, at the end of the first month, six of these may be distinguished. Two belong to the mandibular, and three to the hyoid arch, the remaining one to the uniting band. In the drawings these elevations are indicated by figures 1 to 6. They may, for convenience, be referred to as follows: 1 is the tuberculum tragicum; 2, the tuberculum anterius; 3, tuberculum intermedium; 4, tuberculum antihelicis; 5, tuberculum antitragicum; 6, the lobulus.

The subsequent fate of these tubercles may be briefly given. The tuberculum tragicum unites, across the cleft, with the tuber-

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* "Anatomie menschlicher Embryonem," Leipzig, 1885, Heft. iii., S. 211.

culum antitragicum, the space formerly separating them being simply indicated by the fissure intertragicum. The tuberculum intermedium is the source of the helix, whilst the tuberculum antihelicis furnishes the antihelix; the nodule VI., cut off by the fusion of tragus and antitragus, becomes the lobule. An extension of the helix known as the crus or spina helicis, towards the antitragus, causes a segmentation of the original cavity. In cases of malformation a portion of this may be isolated from the fossa, and give rise to a branchial fissue in the external ear. On these

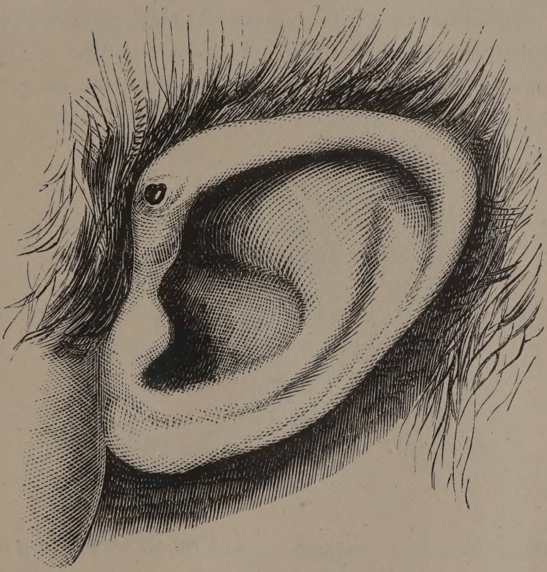

Fig 64.
A Congenital Fistula in the Helix. (After Paget.)

grounds His has come to the opinion that these so-called branchial fistulæ have nothing to do with the cleft from which the ear passage arises.

I have had an opportunity of dissecting the parts in a fœtus with a malformed auricle, in which a fistula like those so well described by Sir James Paget was present, and I satisfied myself that in this case His's view was the correct one. Inasmuch as the whole of this cavity arises from a branchial cleft, so must branchial fistulæ connected with the helix or tragus be regarded as originating in one of these fissures. It will, however, be necessary to divide them into two categories: (1) those originating directly from the cleft, as in Virchow's case, where a probe passed directly into the pharynx; (2) those arising as secondary diverticular formed in consequence of modifications of the pinna during development.

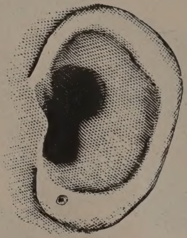

Fig. 65.
A Pinna with a Congenital Fistula in the Lobule.

This confirms Sir James Paget's view when, as I have before stated, he writes that these aural fistulæ may originate in that portion of the cleft which is not utilised in the formation of the Eustachian tube, tympanum, and meatus.

With regard to fistulæ occurring in the lobule of the pinna some remarks must be made. A case has come under my notice where a girl was born with a perforation in the lobule of the left ear, exactly in the situation for putting in earrings. An enthusiast might at once conclude that it was an example of the transmission of an artificial deformity, viz., frequent piercing of the ears leading to an inherited defect. However, a satisfactory explanation of the matter is forthcoming.

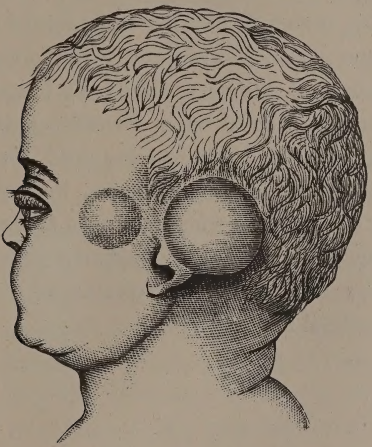

Fig. 66.
An Auricular Dermoid. (After Lannelongue.)

In fig. 63 a gap is seen to exist between the tuberculum antitragicum and the lobulus. When the tubercules I. and V. unite with each other across the intervening notch VI. becomes isolated as the lobule. When this union occurs, if anything should happen to prevent the free edges of V. and VI. from fusing completely an aperture would arise, exactly as in the case of the tubercules I. and II., which are concerned in forming congenital fistulæ in connection with the helix. Hence, as in the case of the helix, a fistula in the lobule originates in a portion of the cleft not utilised in the formation of the various parts of the auditory apparatus.

As a rule, auricles with congenital fistulæ are misshapen as in fig. 64, but this is by no means a constant condition. I have several times seen a fistula in the helix, but the pinna has been of normal shape.

When discussing branchial fistulæ it was pointed out that should the inner and outer extremities of a cleft become closed, whilst the inner segment persisted, the small cavity, by becoming gradually distended by secretion from its walls, manifests itself as a cyst. A similar condition may arise in connection with the pinna. Such cysts are often described as sebaceous, but a more careful examination will show that in some instances at least the cysts are really dermoids in character. The specimen represented in fig. 66 was of this nature, and was associated with a dermoid connected with the orbital fissure.

CHAPTER VII.

OVARIAN DERMOIDS.

The human ovary, like that of most mammals, presents three parts, each giving rise to cysts presenting distinctive features. The three cyst regions are —

1. The oöphoron.
2. The paroöphoron.
3. The parovarium.

These parts are diagramatically represented in fig. 67. The oöphoron is the region in which the ova are found, and is often referred to as the ovarian parenchyma. The paroöphoron is lodged, as it were, in the concavity of the oöphoron; by some writers it is termed the tissue of the hilum. It is almost entirely composed of mesonephritic remains (Wolffian body), in various stages of retrogression. Connected with the paroöphoron is the parovarium, a structure composed of a series of verticle tubules the persistent remnants of the excretory ducts of the mesonephros. The parovarium consists of three parts—a distal series of tubules usually attached by end only; these are Kobelt's tubes; then follows a row of tubules connected by one extremity with the paroöphoron; the opposite end joins a common collecting canal, the representative of the segmental duct known in the adult female as Gartner's duct. The number of tubes in the parovarium varies considerably in individual specimens.

In order to make my remarks comprehensible it will be convenient to divide the subject into three sections, and consider each separately, in the following order :—

1. The characters of the cysts which may be demonstrated anatomically to arise in the oöphoron.
2. The relation of such cysts to the ovarian follicles.
3. The nature of ovarian follicle.

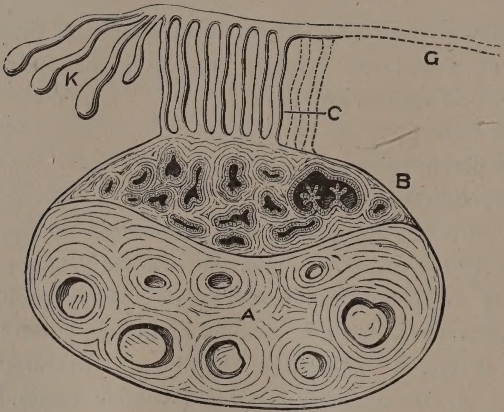

Fig. 67.

A Diagram to represent the Cyst Regions of the Ovary. A, Oöphoron. B, Paroöphoron. C, Parovarium. K, Kobelt's Tubes. G, Gartner's Duct.

Oöphoritic Cysts.

Cystomata arising in the oöphoron may be arranged clinically into the following groups :—

1. Unilocular cysts.
2. Multilocular cysts.
3. Cystic corpora lutea.

1. *Unilocular Cysts.*—The term unilocular is mainly of clinical significance, for it is rare to find an oöphoritic cyst consisting of one cavity only. A careful examination of so-called unilocular cysts will nearly always reveal the existence of numerous smaller loculi in their walls. Nevertheless a single-chambered cyst is now and then seen, but even in some of these a close scrutiny will enable us often to detect the remains of septa in some part or other of the cyst-wall, showing that the cyst was originally compound.

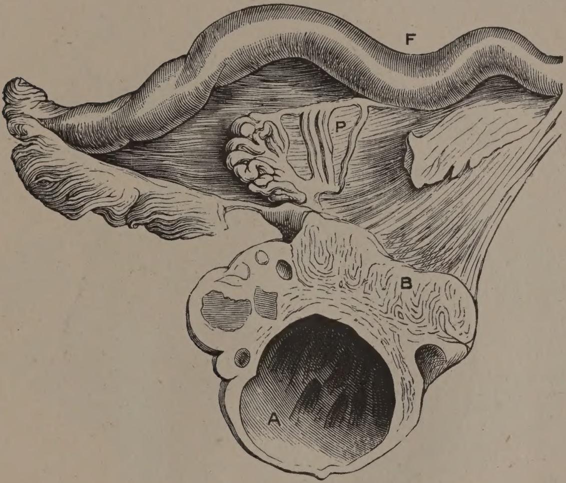

Fig. 68.
An Incipient Oöphoritic Cyst.
A, Oöphoron. B, Paroöphoron. P, Parovarium. F, Fallopian Tube.

An incipient oöphoritic cyst is represented in fig. 68. The cyst is clearly an enlarged ovarian follicle, and its walls have a well-marked membrana granulosa.

In such an early stage it is easy to demonstrate the relation of such cysts to the oöphoron, but as the cyst enlarges it rapidly produces absorption of the ovarian tissue. This is well shown by a specimen of cystic ovary in the museum of the Royal College of Surgeons, prepared by Mr. Doran to demonstrate this point.

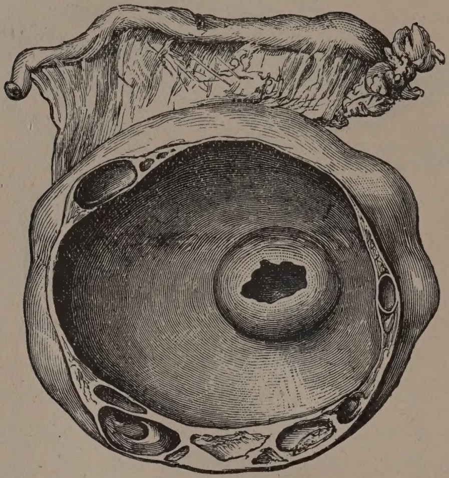

Fig. 69.
Ovarian Cyst, Early Stage. (After Doran.)

The tumour (fig. 69) is only a few inches in diameter, yet the normal relation of the parts is completely destroyed.

The lining membrane of unilocular cysts varies greatly; in very large cysts it is, as a rule, impossible to detect epithelium. This is due to atrophic changes, the consequence of continual pressure exerted by the slowly accumulating fluid. Similar changes and results may be studied in a distended vermiform appendix or in the gall bladder, in the condition known as hydrops vesicæ fellæ. The smaller loculi in the walls of a large cyst often present a lining of typical columnar epithelium. Occasional flattened epithelium may be detected on the walls of fairly large cysts. On several occasions I have found a cyst containing upwards of two quarts of fluid identical with mucus, and the walls lined with a soft, velvety membrane, raised here and there into elevations resembling the cotyledons of a pregnant ruminant's uterus. The membrane

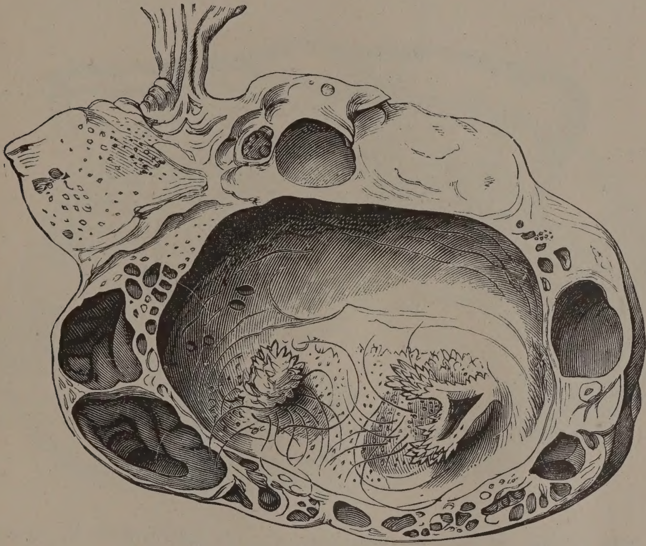

Fig. 70.
A Unilocular Oöphoritic Cyst, containing Skin, Hair, and Nipple-like Tags of Skin.

was beset with rich columnar epithelium, and in many places dipped beneath the surface to form complex mucous glands. The lining of such cysts is, under the microscope, identical with mucous membrane not unlike that of the small intestine.

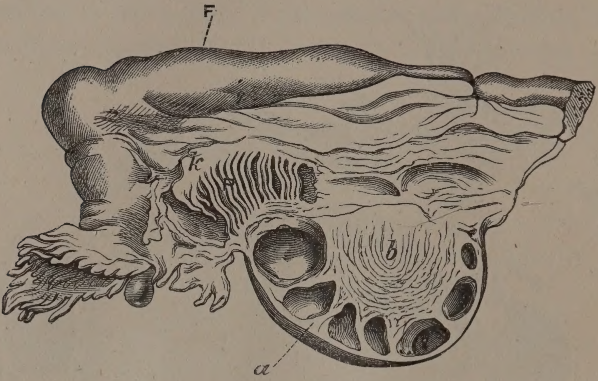

Fig. 71.
A Human Ovary in Section, showing a Multilocular Cyst in an Early Stage.

The credit of first recognising mucous membrane in ovarian cysts belongs to Poupinel; his observations were published in the *Archives de Physiologie*, series iii., vol. ix.*

My observations were made in ignorance of Poupinel's paper, and were conducted along totally different lines.

In a third class of unilocular cysts we find the main cavity lined with skin, furnished with hair, sebaceous glands, teeth, unstriped muscle fibre, and even a nipple (fig. 70).

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* For a review of this paper see the *London Medical Recorder* for 1888, "On Mixed Tumours of the Ovary," p. 234.

The variations in the lining membrane of the main cavity of the unilocular oöphoritic cyst may be summarised thus :—

1. Epithelium may be absent.

2. One or more layers of flattened epithelial cells may be detected.

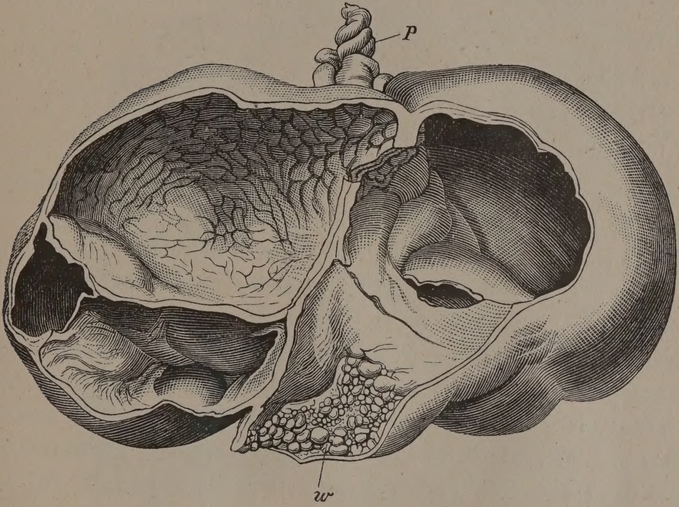

Fig. 72.
A Simple Multilocular Ovarian Cyst with Twisted Pedicle.

3. The interior may be clothed with typical mucous membrane.

4. Skin with its various appendages may be present.

5. In size such cysts may vary from an ordinary ovarian follicle to one containing gallons of fluid.

6. The contents may be a thin and colourless fluid, or thick and tenacious mucus, dark and grumous from admixture with blood,

or contain semi-solid pultaceous matter mixed with hair and epithelial *débris*.

2. *Multilocular Cysts.*—In this group the various tumours are for the most part made up of a congeries of cysts of varying size, so that in typical specimens a section carried through the more solid part of the tumour has an appearance not unlike a honeycomb. For convenience of description they will be considered in three sets—

(*a*) Simple multilocular cysts.
(*b*) Adenomata.
(*c*) Multilocular dermoids.

In each group a type form will be selected, but the three varieties pass, by insensible gradations, one into the other.

The early stage of a multilocular cyst is represented in fig. 71. It shows clearly the restriction of the cysts to the oöphoron. Under the microscope these cavities are indistinguishable from ovarian follicles. In the human female as soon as these follicles attain proportions sufficient to enable them to become perceptible clinically it is impossible to determine in which partof the ovary they had their origin, because they rapidly produce absorption of the ovarian tissues, as has already been illustrated by fig. 69. Nevertheless their growth from ovarian follicles may be actually traced in mares, as will be presently demonstrated. From the condition shown in fig. 71, which may be termed the indifferent stage, the various loculi may continue to increase in size until a tumour of such a size is produced that the individual's life is rendered burdensome merely on account of the mechanical inconvenience induced by it. As the tumour increases in size the various loculi may continue to retain a simple lining of flattened epithelium, which in many of the cavities may be difficult to distinguish, or it may be wanting entirely. Such a tumour is denominated as multilocular (fig. 72), or the epithelium exhibits very active changes, and the cysts become filled with glandular structures, which in some specimens are of considerable complexity;

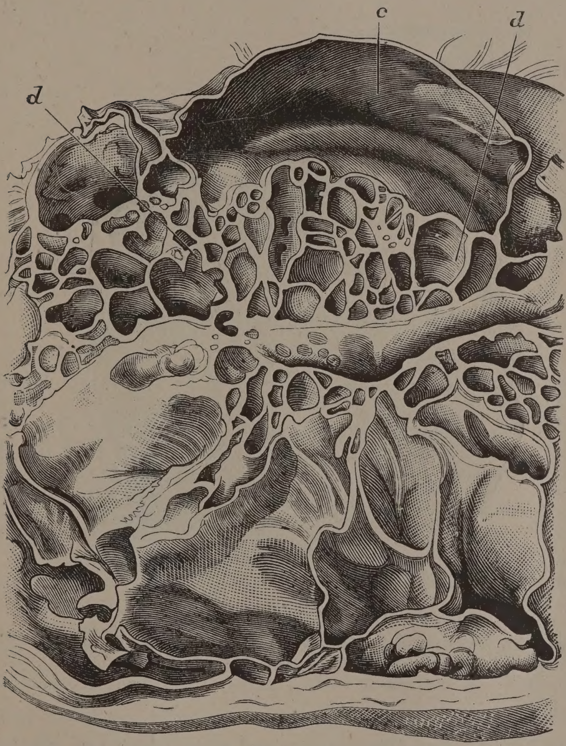

Fig. 73.
Portion of a Multilocular Ovarian Cyst—Adenoma—showing the varieties of Loculi, *c* Primary, *d* Secondary, Ovarian Follicles.

such are termed multilocular glandular, or better ovarian adenomata.

The ovarian adenoma is not only an important, but an extremely interesting variety of tumour. As a rule it is invested by a dense fibrous capsule, and is occasionally lobulated. These tumours attain great dimensions, and are made up of innumerable cysts which vary in size from a microscopic cavity to one holding a quart or more of fluid. Critical dissection of such tumours enables us to recognise three varieties of cysts entering into their composition.

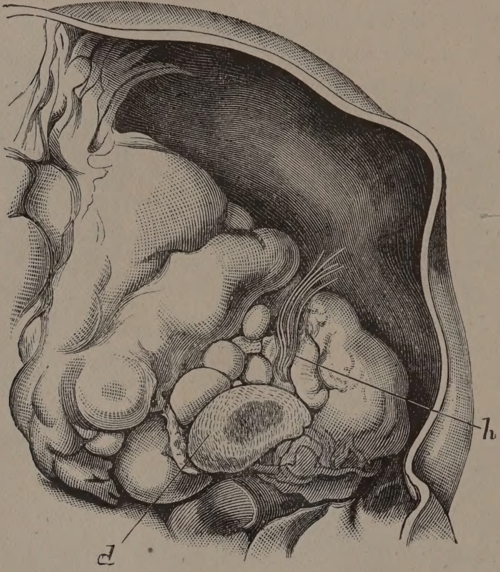

Fig. 74.
Portion of an Ovarian Adenoma containing a Tuft of Hair. (Museum of St. Thomas's Hospital.)

In typical specimens we shall find projecting into some of the larger cavities a honeycomb-like mass occupying usually one-third of its circumference, so that a section of the cavity resembles a signet-ring. Such cysts are primary, whilst the cavities occupying

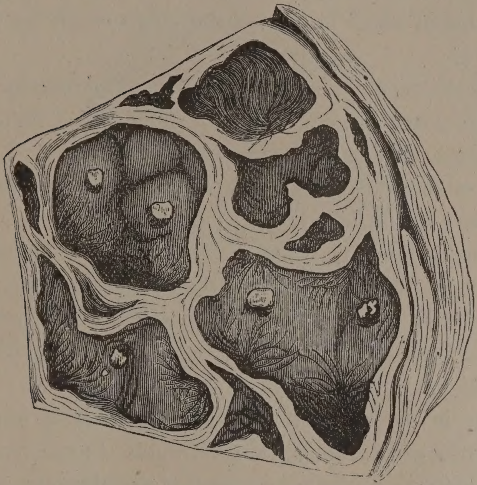

Fig. 75.
A Portion of a Multilocular Ovarian Dermoid.

the honeycomb portion are secondary cysts, and are as a matter of fact mucous retention cysts. The third set of loculi contain no honeycomb-like structures, are of small size, and histologically are indistinguishable from distended ovarian follicles. The three forms of cyst are represented in fig. 73.

The primary cysts in their early stage are lined with rich columnar epithelium, and in that portion of their circumference which corresponds to the honeycomb of larger cysts mucous glands are found. Indeed, the lining membrane of such cysts is identical with mucous membrane. Occasionally a lock of hair may be detected sprouting into one of the larger loculi.

The museum of St. Thomas's Hospital contains an excellent example of this. The specimen is mounted in the teaching series as a type of multilocular ovarian glandular cyst. Sprouting from a small dermoid patch in one of the larger loculi is a tiny tuft of hair (fig. 74).

From multilocular cysts lined with mucous membrane we pass to those which possess in one loculus a small tuft of hair, to others which present skin or mucous membrane furnished with hair, sebaceous or sudoriparous glands, unstriated muscle fibre, fat, and teeth in every loculus (fig. 75).

Occasionally tumours occur presenting three distinct types of cysts; that is, one set of cysts contain skin, hair, sebaceous glands, and teeth; others present only clusters of mucous glands and mucous cysts; and the third set are indistinguishable from ovarian follicles.

Thus, as in the case of unilocular cysts, it is impossible to demarcate between adenomata and dermoids. In specimens without glandular contents it is often impossible to determine whether the lining membrane should be classed as mucous membrane or skin. This was notably the case with the tumour represented in fig. 72, yet I have seen a specimen in every way resembling this possess in one small chamber a rudimentary mamma.

We may here consider some exceptional forms of ovarian cysts. The following condition has, so far as I know, been observed only in connection with dermoids, and this is the distribution of small cysts among the omentum, mesentery, and intestine. In a case of this nature reported by Moore * all the smaller cysts were attached to the main cyst by long pedicles.

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* Path. Soc. Trans., vol. xviii., p.

This fact has lately been rendered more interesting by the researches of Mr. Alban Doran,* who has demonstrated satisfactorily enough that many abdominal dermoids described as non-ovarian are, as a matter of fact, ovarian dermoids that have separated from their pedicles, and this is especially the case with cysts of the omentum. In such specimens necrosis of the dermoid is prevented in virtue of vascular connections it has acquired by means of adhesions to the omentum before its original connections with the ovary were lost. Ovarian dermoids are notorious for contracting adhesions, and the extent

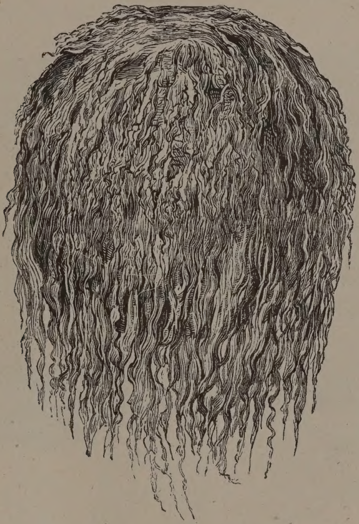

Fig. 76.

An Ovarian Dermoid, villous with Adhesions. (After Doran.)

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* Med.-Chir. Trans., vol. lxviii., p. 235.

to which this occurs may be inferred from a glance at fig. 76, taken from a specimen in the museum of the Royal College of Surgeons.

A very good example of this kind of adhesion and subsequent attachment came under my notice in 1887. The specimen was exhibited at the British Gynæcological Society, by Mr. Grigg Smith. The tumour was adherent to the omentum, but a thin, frail band of tissue connected it with the right angle of the uterus. The tumour was multilocular; the largest cyst was as big as a melon; in one of the smaller loculi a small tuft of skin contain-

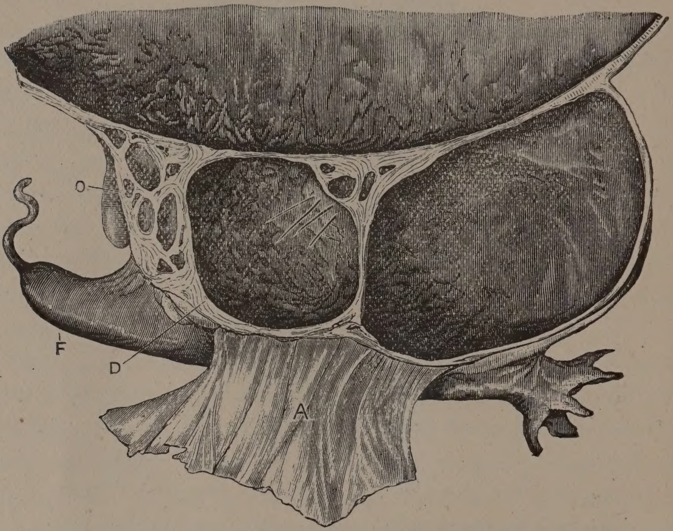

Fig. 77.

An Ovarian Dermoid which has nearly detached its Pedicle, and acquired new attachments to the Omentum.

O, Ovary. D, Dermoid. F, Fallopian Tube. A, Omentum.

ing hair and glands was found (fig. 77). The chief adhesions were connected with this part of the cyst; other slender bands existed on other parts of the tumour, but those marked A in the drawing were by far the most important. The thin ligament which connected the tumour with the uterus was the attenuated portion of the Fallopian tube.

Such a case as this is intermediate to the cases of completely detached dermoids. Thus Doran* describes a specimen of the size of a cricket-ball, which was found adherent to the omentum. The right ovary was found at the operation to be cystic; the left Fallopian tube was obstructed and slightly dilated; close to it, in the site of the ovarian ligament, lay a short, firm tag of fatty and partly calcareous tissue. This specimen is also in the College museum.

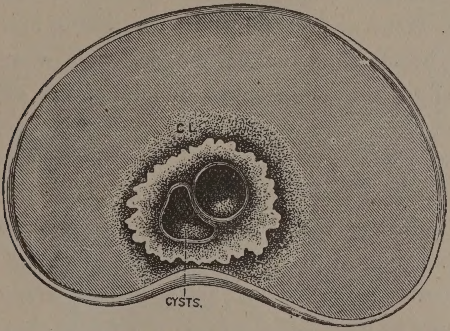

Fig. 78.

A Cystic Corpus Luteum from the Ovary of a Mare.

The explanation of the detachment is to be found in the tendency exhibited by ovarian cysts, especially dermoids, to undergo axial rotation, whereby the pedicle becomes twisted. Should the twisting occur rapidly gangrene of the sac may follow, but if it twists gradually adhesions are acquired, whereby the vitality of the tumour is maintained and its original pedicle is lost.

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* "Tumours of the Ovary," p. 122.

3. *Cystic Corpora Lutea.*—Cysts arising in corpora lutea are interesting pathologically, but of no clinical import, as they rarely attain a large size. Such cysts are occasionally found in the human ovary, but they occur with great frequency in the ovary of the cow, mare, and numerous other mammals. In the recent state they are easily recognised, the walls of the cyst presenting the characteristic yellow tissue; the cyst-wall when examined microscopically does not present a definite lining membrane or epithelium.

In very rare cases cysts developed in corpora lutea have contained solid facetted bodies resembling calculi.

2. *The Relation of Oöphoritic Cysts to the Ovarian Follicles.*—It has always appeared to me contrary to the dictates of common sense and sound reasoning when attempts are made to ascribe oöphoritic cysts to tissues of the ovary other than those connected with the follicles. To ignore the ovarian follicles in this matter, and attribute cystomata to epithelial ingrowths and such mythical structures as Pflüger's tubes, is absurd.

We have already seen that in their early stage oöphoritic cysts are restricted to the egg-bearing segment of the ovary, and in their early stages are indistinguishable from ovarian follicles. This was well illustrated in the ovary represented in fig. 71, but the connection may be traced much more completely in the ovaries of mares. In mares of the age of ten years or upwards the oôphoron is invariably occupied by dilated follicles, cystic corpora lutea, or both; these ovaries are the more instructive because they possess a very large paroöphoron. It has already been pointed out that when the follicles attain a moderate size in the human ovary the paroöphoron is absorbed and the real relation of the parts disturbed; this is not so in the mare, and even in a tumour which weighed eighty-four pounds the cysts remained restricted to the oöphoron, and were histologically identical with ovarian follicles; many of them contained mucous glands (fig. 79).

We will consider the anatomy of an ovarian follicle, in order to ascertain the relation between it and the primary cysts of a multilocular tumour or ovarian adenoma. The ova of mammals differ from those of other vertebrata in the fact that they are enclosed by a membrana granulosa. In a fully developed follicle the cells are arranged two or more rows deep, the surface cells being more

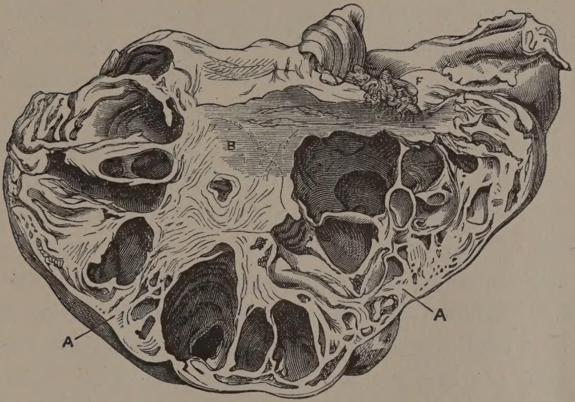

Fig. 79.

Transverse Section of an Ovarian Tumour from a Mare; it weighed eighty-four pounds. A, Oöphoron. B, Paroöphoron. F, Fallopian Fimbriæ.

or less columnar. At one point the cells form a prominence, the discus proligerus, in which the ovum is embedded. The surface cells are more distinctly columnar in the neighbourhood of the disc than elsewhere. The membrana granulosa secretes a fluid known as the liquor folliculi. Thus, in section the ripe follicle has an appearance like a signet-ring (fig. 80).

If a ripe follicle be compared with a primary cyst in an ovarian adenoma (fig. 73) the comparison is very suggestive, especially when we note the restriction of the glandular material to the signet portion of the cyst. This is even more suggestive if we examine the smaller cysts. In the accompanying drawing (fig. 81) three cysts from an ovarian multilocular dermoid are represented in juxtaposition. The cyst *a* is barren, but *b* is lined with a layer of rich columnar epithelium, with a small cluster of glands, whereas *c* resembles *b*, but has a much larger collection of mucous glands. In the next stage we have obstruction to the free flow of secretion from these glands, inasmuch as it passes into a closed cavity, hence they are always subject to pressure; the result of this is to produce a retention cyst, the honeycomb structure of fig. 73. These facts tend to show that when an ovarian follicle becomes cystic there is a tendency for the surface cells of the discus proligerus to dip beneath the surface and form mucous glands of great complexity, and as the cyst assumes greater proportions these glands become mucous retention cysts. Hence the signet-like mass in the primary cyst is to be regarded as an enlarged discus proligerus.

These principles are applicable to multilocular dermoids also, for a critical examination of the loculi will reveal the fact that in most of them there is a restriction of the glandular elements to one section of the cyst wall, and it is quite an exception to find glands distributed evenly throughout the whole lining membrane.

The two sections of my argument which we have just considered show that the division of oöphoritic cysts into unilocular and multilocular is merely a clinical convenience, and that we can actually pass by easy stages from a unilocular cyst without an epithelial lining to multilocular tumours rich in glands, containing structures as elaborate as a mamma oreven a rudimentary eye. The mystery up ta the present time has been to definitely account for the origin of glandular tissue in such cysts, for it is well established that adenomata can arise only in connection with pre-existing gland tissue. It has already been stated that the membrana granulosa possesses glandular functions, inasmuch as it secretes the liquor folliculi. It behoves us, therefore, to institute a comparison between the ovarian follicle and glands in general, in order to ascertain if any phylogenetic justification exist for their extraordinary behaviour.

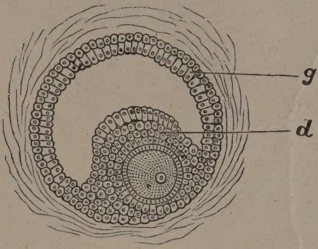

Fig. 80.
A Ripe Ovarian Follicle.
g, Membrana Granulosa. *d*, Discus Proligerus.

3. *The Nature of the Ovarian Follicle.*—Having demonstrated the origin of oöphoritic cysts in the ovarian follicles, it remains for us to inquire into the nature of the follicles, and why they furnish

adenomata, for it is contrary to pathological reasoning that glandular tumours should arise in situations unprovided with glands.

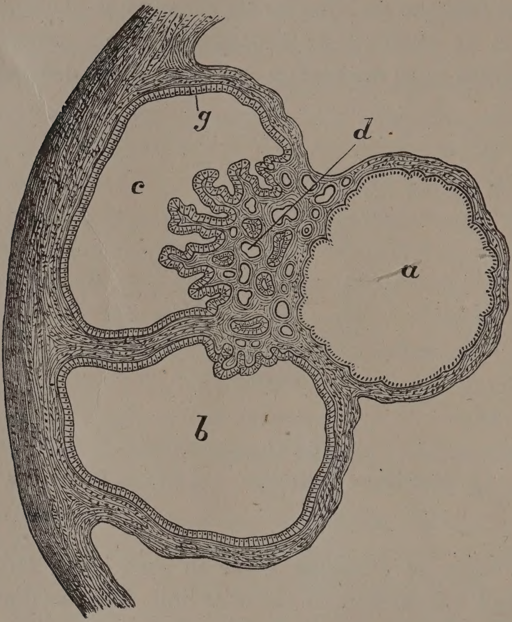

Fig. 81.
A Drawing representing Three Stages of an Ovarian Adenoma.

This inquiry involves the phylogeny of the ovarian follicles, and is intimately bound up with the history of the peritonæum.

The cœlom (pleuro-peritoneal cavity) in most vertebrates arises as a schizocœle, due to the splitting of the side walls of the embryo into somato-pleure and splanchno-pleure. This mode of origin is secondary, for in its simpler form the cœlom is due to portions of the gastrula becoming abstricted from a central portion which persists as the alimentary canal. To put the matter briefly, the cœlom, according to the Hertwigs, is a diverticulum of the gut, and its surface is covered with epithelium; therefore the cells which dip below the surface of the genital ridge to form ova and ovarian follicles are of the same nature as those which in the gut dip below the surface to form mucous glands. The process is well exemplified in the skin of the salamander (fig. 82), where downgrowths of the surface epithelium intended to form glands are at first solid, then acquire a lumen with cells arranged peripherally; the mucus contained in the cavity escapes externally by means of an orifice.

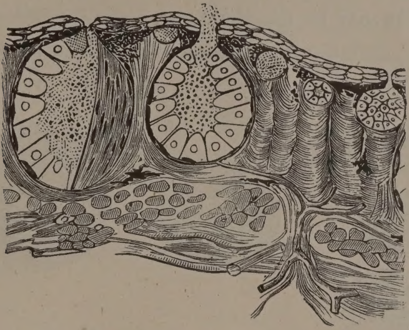

Fig. 82.
Microscopical View of the Skin of an Adult Salamander.
(After Wiedersheim.)

The ovary of a frog in the breeding season is very instructive; it consists of a main cavity with numerous diverticula. These are lined with cells, but at intervals we find a cell much larger than the neighbouring ones; the large cells are ova, and on section a diverticulum of a frog ovary irresistibly suggests the notion of a gland secreting ova (fig. 83).

In mammals we find instead of a simple gland, a complex one, the acini of the gland being represented by the follicles. Indeed, ovarian follicles in their mode of origin and pathological relations are glands. It may be urged that in order to make my argument complete the ovarian follicle needs a duct. In many invertebrata

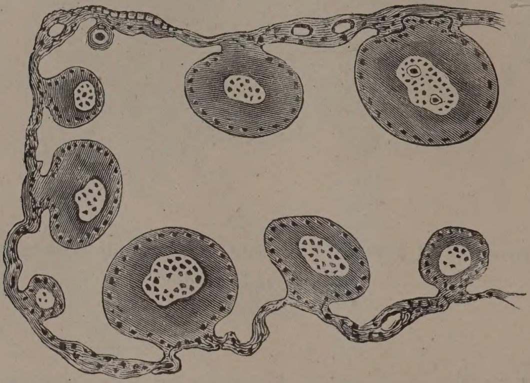

Fig. 83.

A Section of the Wall of an Ovarian Diverticulum, from a Frog.

the ovary is furnished with a duct for the excretion of ova, but in vertebrata the female reproductive organs have undergone such profound modifications that the ova are shed into the peritonæal cavity, and in a few forms escape to the outer world by way of the abdominal pores. In higher types the disused ureter or ureters, which formerly served as the excretory conduits of the pronephros, become modified as egg-channels. Thus Müller's ducts in the female, like the Wolffian ducts in the male, have undergone a very remarkable change of function.

If it be necessary to compare pathological conditions of the follicles with diseases of other glandular acini, such as those of the breast, we can compare them with adenoceles and adenomata.

Thus, on morphological, embryological, and pathological grounds, the identity of ovarian follicles with the acini of glands is complete, and I have no hesitation in regarding the *follicles of the ovary as mucous crypts.* As the membrana granulosa is potentially mucous membrane, and as skin and mucous membrane are morphologically identical and convertible structures, cysts containing skin or mucous membrane and their appendages are not more remarkable than cysts and neoplasms occurring in connection with other glands.

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